Altivar 31

Programming manual

Variable speed drives
for asynchronous motors

a brand of Schneider Electric

Telemecanique

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NOTE: Please also refer to the "Installation Guide".

Warnings

When the drive is powered up, the power components and some of the control components are connected to the line supply. It is extremely dangerous to touch them. *The drive cover must be kept closed.*

In general, the drive power supply must be disconnected before any operation on either the electrical or mechanical parts of the installation or *machine.*
After the ALTIVAR has been switched off and the display has disappeared completely, *wait for 10 minutes before working on the equipment*. This is the time required for the capacitors to discharge.
The motor can be stopped during operation by inhibiting start commands or the speed reference while the drive remains powered up. If personnel safety requires prevention of sudden restarts, this electronic locking system is not sufficient: *fit a cut-off on the power circuit.*

The drive is fitted with safety devices which, in the event of a fault, can shut down the drive and consequently the motor. The motor itself may be stopped by a mechanical blockage. Finally, voltage variations, especially line supply failures, can also cause shutdowns.
If the cause of the shutdown disappears, there is a risk of restarting which may endanger certain machines or installations, especially those which must conform to safety regulations.

In this case the user must take precautions against the possibility of restarts, in particular by using a low speed detector to cut off power to the drive if the motor performs an unprogrammed shutdown.

The drive must be installed and set up in accordance with both international and national standards. Bringing the device into conformity is the responsibility of the systems integrator who must observe the EMC directive among others within the European Union.
The specifications contained in this document must be applied in order to comply with the essential requirements of the EMC directive.

The Altivar 31 must be considered as a component: it is neither a machine nor a device ready for use in accordance with European directives (machinery directive and electromagnetic compatibility directive). It is the responsibility of the end user to ensure that the machine meets these standards.

The drive must not be used as a safety device for machines posing a potential risk of material damage or personal injury (lifting equipment, for example). In such applications, overspeed checks and checks to ensure that the trajectory remains under constant control must be made by separate devices which are independent of the drive.

The products and equipment described in this document may be changed or modified at any time, either from a technical point of view or in the way they are operated. Their description can in no way be considered contractual.

Steps for setting up the starter

1 - Delivery of the drive

- Check that the drive reference printed on the label is the same as that on the delivery note corresponding to the purchase order.
- Remove the Altivar 31 from its packaging and check that it has not been damaged in transit.

2 - Check that the line voltage is compatible with the supply voltage range of the drive

(see the ATV 31Installation Manual).

- The drive may be damaged if the line voltage is not compatible.

3 - Fit the drive

4 - Connect the following to the drive:

- The line supply, ensuring that it is:
  - **compatible with the voltage range of the drive**
  - **switched off**
- The motor, ensuring that its coupling corresponds to the line voltage
- The control via the logic inputs
- The speed reference via the logic or analog inputs

5 - Switch on the drive, but do not give a run command

6 - Configure the following:

The nominal frequency (bFr) of the motor, if it is different from 50 Hz.

7 - Configure the following in the drC- menu:

The motor parameters, only if the factory configuration of the drive is not suitable.

8 - Configure the following in the I-O-, CtL- and FUn- menus:

The application functions (only if the factory configuration of the drive is not suitable), for example the control mode: 3-wire, or 2-wire transition detection, or 2-wire level detection, or 2-wire level detection with forward direction priority, or local control for ATV31●●●A.

The user must ensure that the programmed functions are compatible with the wiring diagram used.

9 - Set the following in the SEt- menu:

- The ACC (Acceleration) and dEC (Deceleration) parameters
- The LSP (Low speed when the reference is zero) and HSP (High speed when the reference is maximum) parameters
- The ItH parameter (Motor thermal protection)

10 - Start the drive

Practical recommendations

- Preparations can be made for programming the drive by filling in the configuration and settings tables (see page 70), in particular when the factory configuration has to be changed.
- It is always possible to **return to the factory settings** using the FCS parameter in the drC-, I-O-, CtL- and FUn- menus (set InI to activate the function, see page 22, 25, 36 or 59).
- Auto-tuning, which is performed using the drC- menu, can be applied to optimize performance in terms of accuracy and response time. Auto-tuning measures the stator resistance of the motor in order to optimize the control algorithms.

Factory configuration

Factory settings

The Altivar 31 is factory-set for the most common operating conditions:
- Display: Drive ready (rdY) with motor stopped, and motor frequency with motor running
- Motor frequency (bFr): 50 Hz
- Constant torque application with sensorless flux vector control (UFt = n)
- Normal stop mode on deceleration ramp (Stt = rMP).
- Stop mode in the event of a fault: Freewheel
- Linear ramps (ACC, dEC): 3 seconds
- Low speed (LSP): 0 Hz
- High speed (HSP): 50 Hz
- Motor thermal current (ItH) = nominal motor current (value depending on drive rating)
- Standstill injection braking current (SdC) = 0.7 x nominal drive current, for 0.5 seconds
- Automatic adaptation of the deceleration ramp in the event of overvoltage on braking
- No automatic restarting after a fault
- Switching frequency 4 kHz
- Logic inputs:
  - LI1, LI2 (2 directions of operation): 2-wire transition detection control, LI1 = forward, LI2 = reverse, inactive on ATV 31●●●●●●A drives (not assigned)
  - LI3, LI4: 4 preset speeds (speed 1 = speed reference or LSP, speed 2 = 10 Hz, speed 3 = 15 Hz, speed 4 = 20 Hz).
  - LI5 - LI6: Inactive (not assigned)
- Analog inputs:
  - AI1: Speed reference 0-10 V, inactive on ATV 31●●●●●●A (not assigned)
  - AI2: Summed speed reference input 0±10 V
  - AI3: 4-20 mA inactive (not assigned)
- Relay R1: The contact opens in the event of a fault (or drive off)
- Relay R2: Inactive (not assigned)
- Analog output AOC: 0-20 mA inactive (not assigned)

ATV 31●●●●●●A range

When they leave the factory, ATV 31●●●●●●A drives are supplied with local control activated: the RUN, STOP buttons and the drive potentiometer are active. Logic inputs LI1 and LI2 and analog input AI1 are inactive (not assigned).

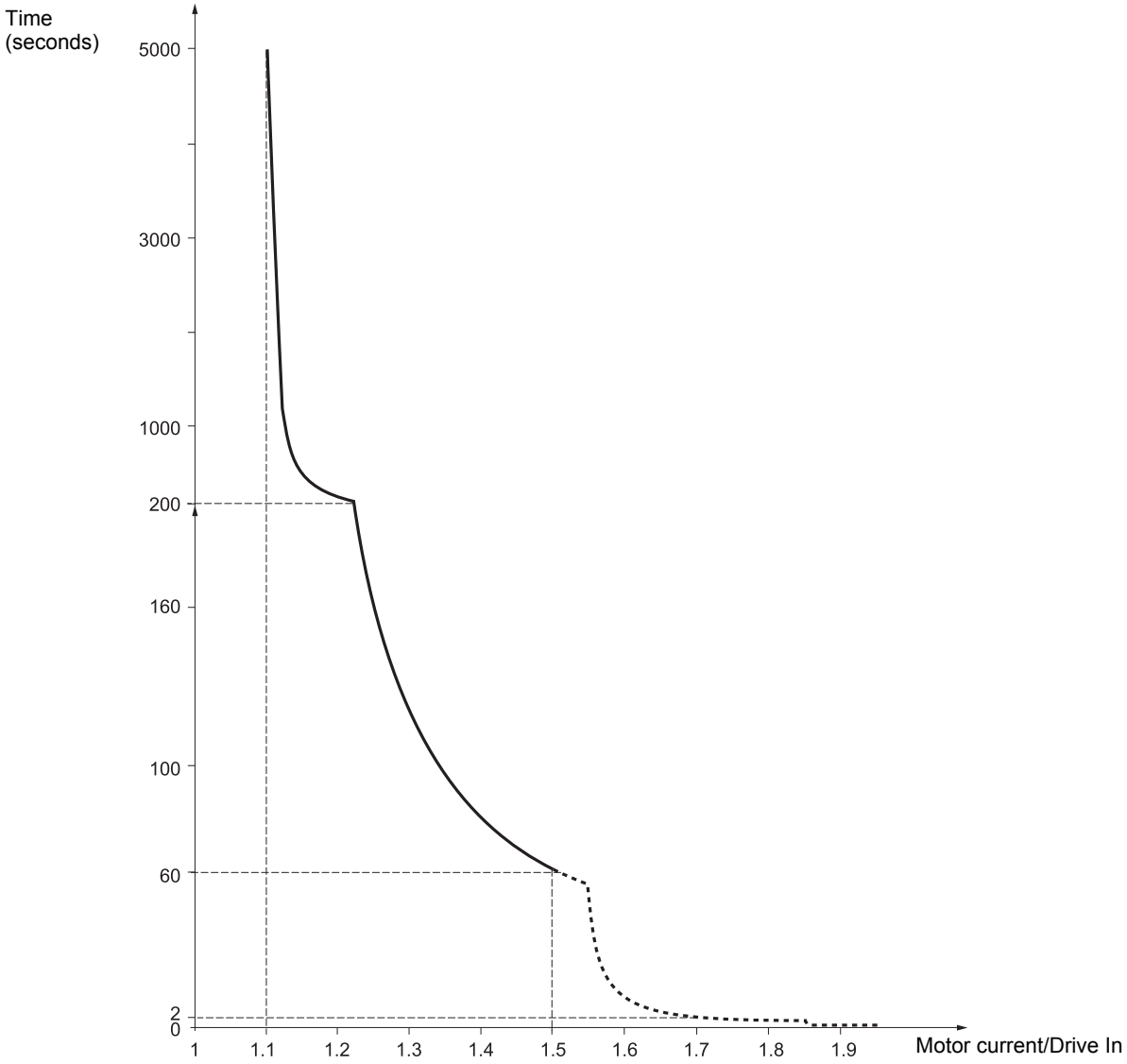
If the above values are compatible with the application, the drive can be used without changing the settings.

Drive thermal protection

Functions:

Thermal protection by PTC probe fitted on the heatsink or integrated in the power module.
Indirect protection of the drive against overloads by tripping in the event of an overcurrent. Typical tripping points:

- Motor current = 185% of nominal drive current: 2 seconds
- Motor current = 150% of nominal drive current: 60 seconds



Drive ventilation

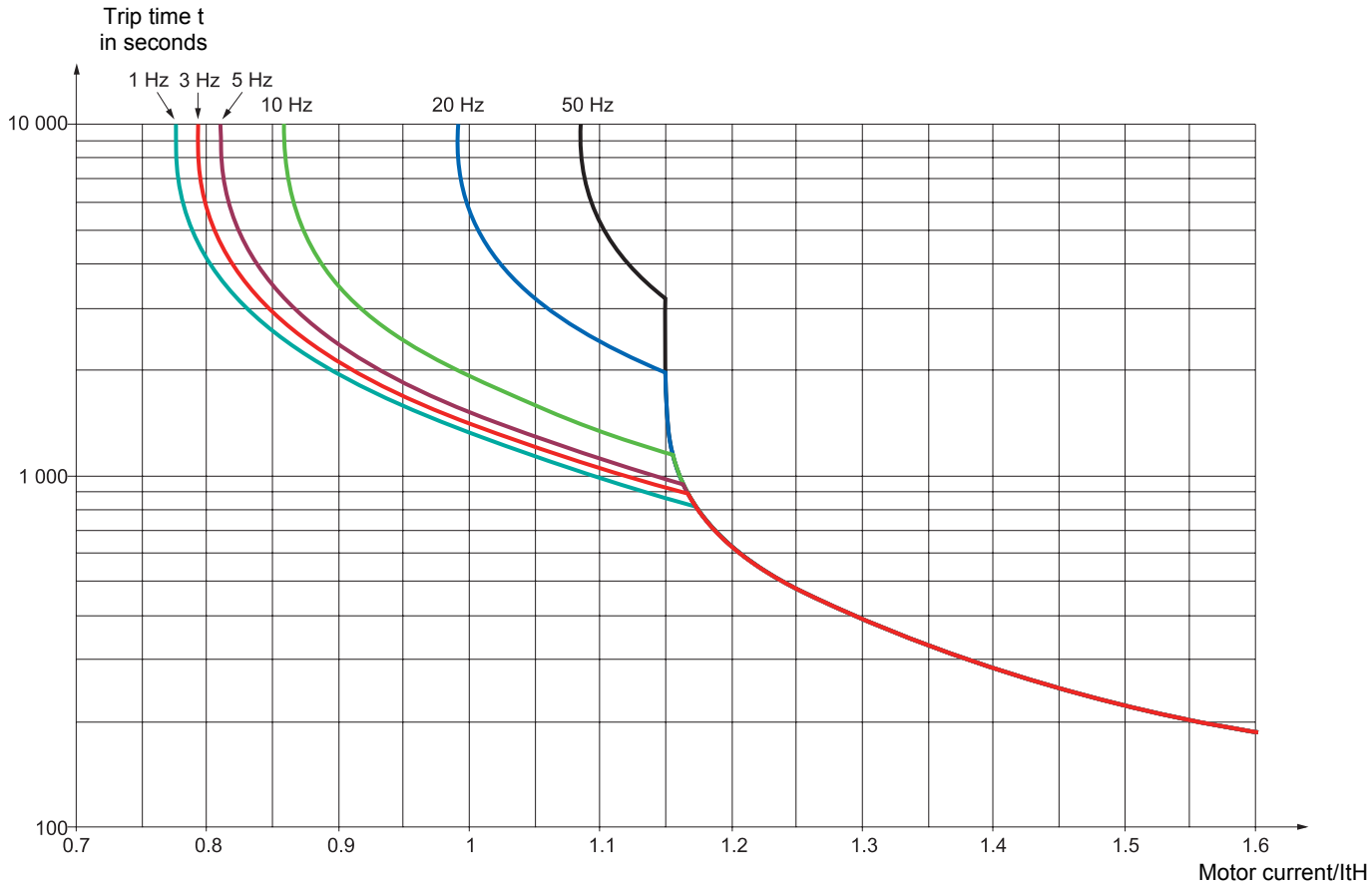
The fan starts up when the drive is powered up then shuts down after 10 seconds if a run command has not been received.
The fan is powered automatically when the drive is unlocked (operating direction + reference). It is powered down a few seconds after the drive is locked (motor speed < 0.2 Hz and injection braking completed).

Motor thermal protection

Function:

Thermal protection by calculating the I^2t.
The protection takes account of self-cooled motors.

Caution: The memory of the motor thermal state returns to zero when the drive is disconnected.



Setup - Preliminary recommendations

Prior to switching on and configuring the drive

- **Check that the line voltage is compatible with the supply voltage range of the drive (see pages 3 and 4 of the ATV 31 Installation Manual). The drive may be damaged if the line voltage is not compatible.**
- **Ensure the logic inputs are switched off (state 0) to prevent accidental starting. Otherwise, an input assigned to the run command may cause the motor to start immediately on exiting the configuration menus.**

With power switching via line contactor

- **Avoid operating the contactor frequently (premature ageing of the filter capacitors). Use inputs LI1 to LI6 to control the drive.**
- **These instructions are vital for cycles < 60 s, otherwise the load resistor may be damaged.**

User adjustment and extension of functions

If necessary, the display and buttons can be used to modify the settings and to extend the functions described in the following pages. It is very easy to **return to the factory settings** using the FCS parameter in the drC-, I-O-, CtL- and FUn- menus (set InI to activate the function, see page 22, 25, 36 or 59).
There are three types of parameter:
- Display: Values displayed by the drive
- Setting: Can be changed during operation or when stopped
- Configuration: Can only be modified when stopped and no braking is taking place. Can be displayed during operation.

- **Check that changes to the current operating settings do not present any danger. Changes should preferably be made with the drive stopped.**

Start up

Important: In factory settings mode on power-up, or in a manual fault reset or after a stop command, the motor can only be powered once the "forward", "reverse" and "DC injection stop" commands have been reset. If they have not been reset, the drive will display "nSt" but will not start. If the automatic restart function is configured (parameter Atr in the FLt- menu, see page 60), these commands are taken into account without a reset being necessary.

Test on a low power motor or without a motor

- In factory settings mode, "motor phase loss" detection is active (OPL = YES). To check the drive in a test or maintenance environment without having to switch to a motor with the same rating as the drive (particularly useful in the case of high power drives), deactivate "motor phase loss" detection (OPL = NO).
- Configure the voltage/frequency ratio: UFt = L (drC- menu on page 21)

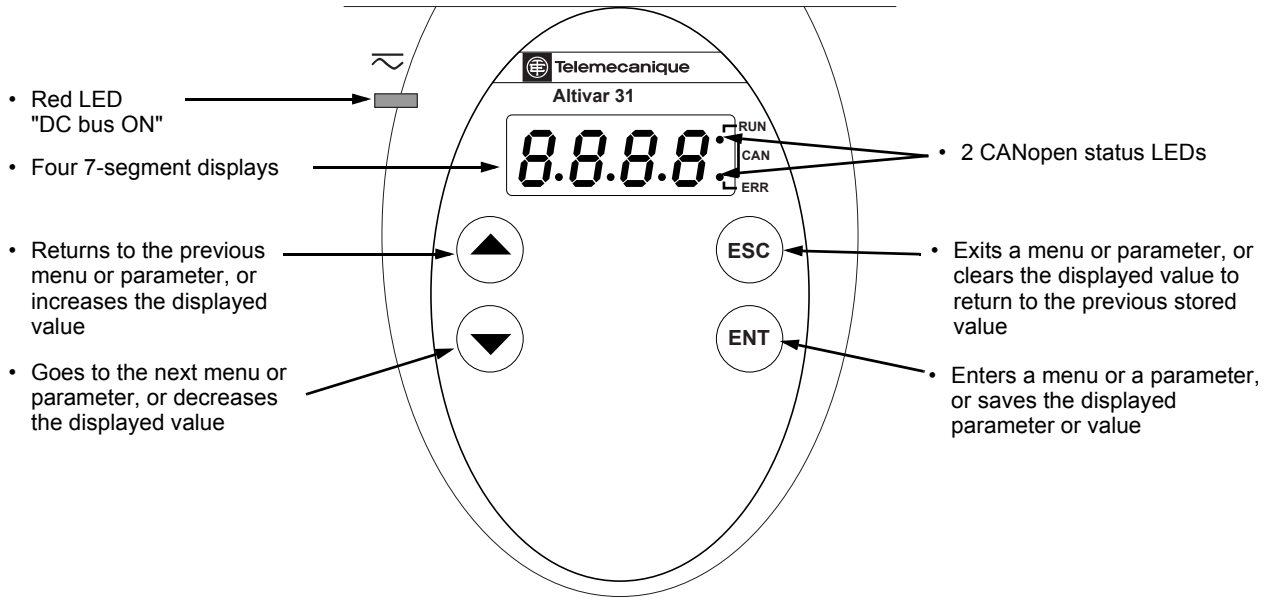
- Motor thermal protection will not be provided by the drive if the motor current is less than 0.2 times the nominal drive current.

Using motors in parallel

- Configure the voltage/frequency ratio: UFt = L (drC- menu on page 21)

- Motor thermal protection is no longer provided by the drive. Provide an alternative means of thermal protection on every motor.

Functions of the display and the keys


• Red LED "DC bus ON"
• Four 7-segment displays
• Returns to the previous menu or parameter, or increases the displayed value
• Goes to the next menu or parameter, or decreases the displayed value
Telemecanique
Altivar 31
RUN
CAN
ERR
ESC
ENT
• 2 CANopen status LEDs
• Exits a menu or parameter, or clears the displayed value to return to the previous stored value
• Enters a menu or a parameter, or saves the displayed parameter or value

• Pressing ▲ or ▼ does not store the selection.

• Press and hold down (>2 s) ▲ or ▼ to scroll through the data quickly.

To save and store the selection: ENT

The display flashes when a value is stored.

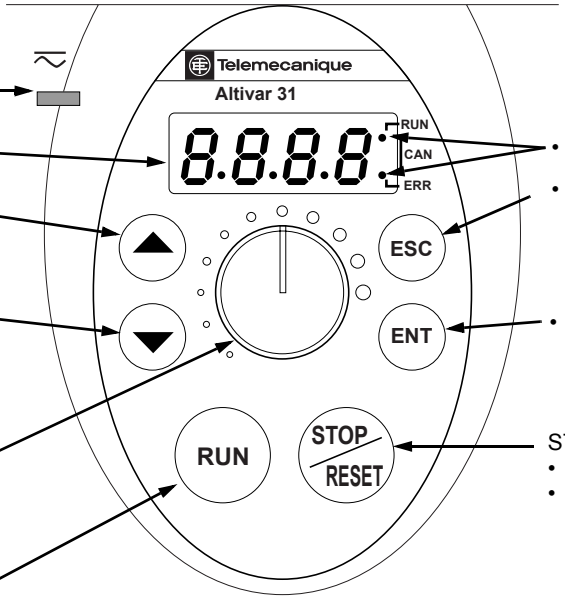
Normal display, with no fault present and no starting:

- 43.0: Display of the parameter selected in the SUP- menu (default selection: motor frequency). In current limit mode, the display flashes.
- init: Initialization sequence
- rdY: Drive ready
- dcb: DC injection braking in progress
- nSt: Freewheel stop
- FSt: Fast stop
- tUn: Auto-tuning in progress

The display flashes to indicate the presence of a fault.

Functions of the display and the keys

ATV31●●●●●●A:



- Red LED "DC bus ON"
- Four 7-segment displays
- Returns to the previous menu or parameter, or increases the displayed value
- Goes to the next menu or parameter, or decreases the displayed value
- Reference potentiometer, active if the Fr1 parameter in the CtL- menu is configured as AIP
- RUN button: Controls motor switch-on in forward mode, if parameter tCC in the I-O- menu is configured as LOC

- 2 CANopen status LEDs
- Exits a menu or a parameter, or clears the displayed value to return to the previous stored value
- Enters a menu or a parameter, or saves the displayed parameter or value

STOP/RESET button
- Used to reset faults
- Can be used to control motor stopping
  - If tCC (I-O- menu) is not configured as LOC, it is a freewheel stop.
  - If tCC (I-O- menu) is configured as LOC, stopping is on a ramp, but if injection braking is in progress, a freewheel stop takes place.

• Pressing ▲ or ▼ does not store the selection.

• Press and hold down (>2 s) ▲ or ▼ to scroll through the data quickly.

To save and store the selection: ENT

The display flashes when a value is stored.

Normal display, with no fault present and no starting:
- 43.0: Display of the parameter selected in the SUP- menu (default selection: output frequency applied to the motor). In current limit mode, the display flashes.
- init: Initialization sequence
- rdY: Drive ready
- dcb: DC injection braking in progress
- nSt: Freewheel stop
- FSt: Fast stop
- tUn: Auto-tuning in progress

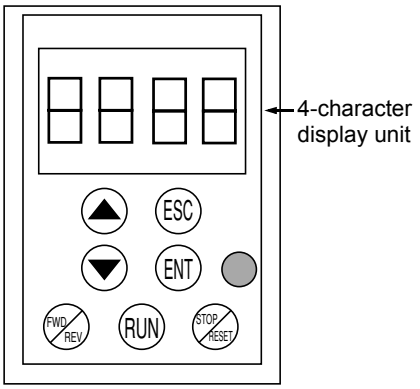
The display flashes to indicate the presence of a fault.

Remote terminal option

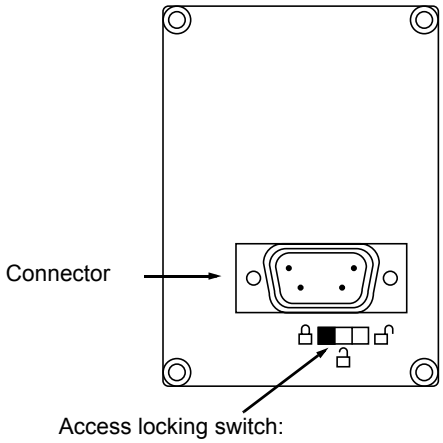
This module is a local control unit which can be mounted on the door of the wall-mounted or floor-standing enclosure. It has a cable with connectors, which is connected to the drive serial link (see the manual supplied with the terminal). It has the same display and the same programming buttons as the Altivar 31 with the addition of a switch to lock access to the menus and three buttons for controlling the drive:
- FWD/REV: reversal of the direction of rotation
- RUN: motor run command
- STOP/RESET: Motor stop command or fault reset

Pressing the button a first time stops the motor, and if DC injection standstill braking is configured, pressing it a second time stops this braking.

View of the front panel:



View of the rear panel:



- positions: settings and display accessible (SEt- and SUP- menus)
- position: all menus can be accessed

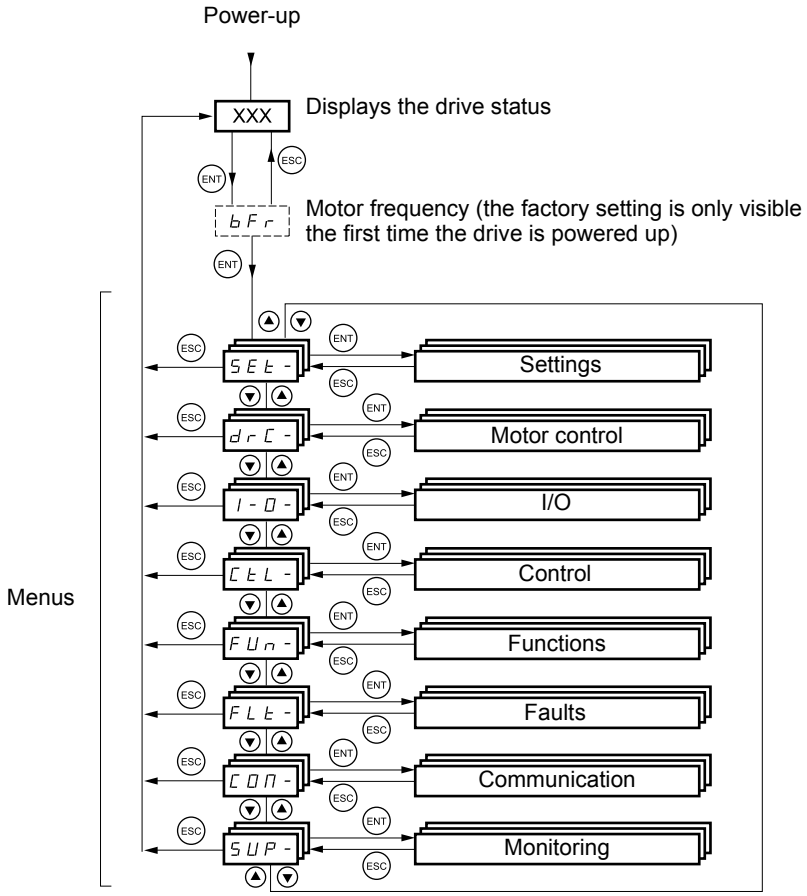
Note: Customer password protection has priority on the switch.

- The access locking switch on the remote terminal also prevents the drive settings being accessed via the keypad.
- When the remote terminal is disconnected, if the drive has been locked, the keypad will remain locked.
- In order for the remote terminal to be active, the tbr parameter in the COM- menu must remain in factory settings mode: 19.2 (see page 73).

Saving and loading configurations

Up to four complete configurations for ATV 31 drives can be stored on the remote terminal. These configurations can be saved, transported and transferred from one drive to another of the same rating. 4 different operations for the same device can also be stored on the terminal. See the SCS and FCS parameters in the drC-, I-O-, CtL- and FUn- menus.

Access to menus



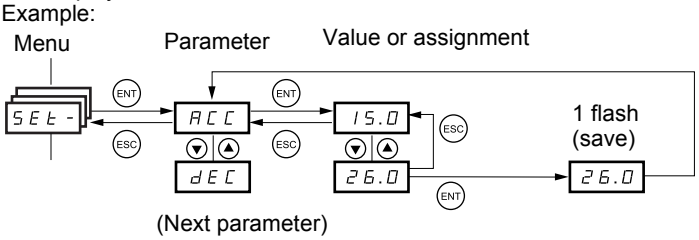
Some parameters can be accessed in a number of menus for increased user-friendliness:
- Entering settings
- Return to factory settings
- Restoring and saving the configuration

A dash appears after menu and sub-menu codes to differentiate them from parameter codes.
Examples: FUn- menu, ACC parameter.

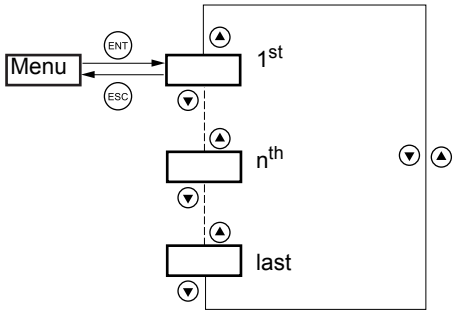
Accessing menu parameters

To save and store the selection: ENT

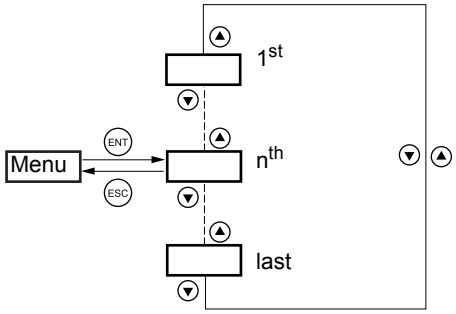
The display flashes when a value is stored.
Example:



All the menus are "drop-down" type menus, which means that after the last parameter, if you continue to press ▼, you will return to the first parameter and, conversely, you can switch from the first parameter to the last parameter by pressing ▲.



If, after modifying any of the parameters (n^{th}), you quit a menu and return to this menu without having accessed another menu in the meantime, you will be taken directly to the n^{th} parameter (see below). If, in the meantime, you have accessed another menu or have restarted the system, you will always be taken to the first parameter in the menu (see above).



Configuration of the bFr parameter

This parameter can only be modified in stop mode without a run command.

bFr

Code	Description	Adjustment range	Factory setting
bFr	**Standard motor frequency**		50
	This parameter is only visible the first time the drive is switched on. It can be modified at any time in the drC- menu. 50 Hz: IEC 60 Hz: NEMA This parameter modifies the presets of the following parameters: HSP page 16, Ftd page 19, FrS page 20 and tFr page 22.		

Function compatibility

Incompatible functions

The following functions will be inaccessible or deactivated in the cases described below:

Automatic restart

This is only possible for 2-wire level detection control (tCC = 2C and tCt = LEL or PFO).

Flying restart

This is only possible for 2-wire level detection control (tCC = 2C and tCt = LEL or PFO).
This function is locked if automatic standstill injection is configured as DC (AdC = Ct).

Reverse

On the ATV31●●●A range only, this function is locked if local control is active (tCC = LOC).

Function compatibility table

The choice of application functions may be limited by the number of I/O and by the fact that some functions are incompatible with one another. Functions which are not listed in this table are fully compatible.
If there is an incompatibility between functions, the first function configured will prevent the remainder being configured.

	Summing inputs	+/- speed (1)	Management of limit switches	Preset speeds	PI regulator	Jog operation	Brake sequence	DC injection stop	Fast stop	Freewheel stop
Summing inputs		●		↑	●	↑				
+/- speed (1)	●			●	●	●				
Management of limit switches					●					
Preset speeds	←	●			●	↑				
PI regulator	●	●	●	●		●	●			
Jog operation	←	●		←	●		●			
Brake sequence					●	●		●		
DC injection stop							●			↑
Fast stop										↑
Freewheel stop								←	←	

(1) Excluding special application with reference channel Fr2 (see diagrams 28 and 30)

● Incompatible functions Compatible functions Not applicable

Priority functions (functions which cannot be active simultaneously):

← ↑ The function indicated by the arrow has priority over the other.

Stop functions have priority over run commands.
Speed references via logic command have priority over analog references.

⚠ Logic and analog input application functions

Each of the functions on the following pages can be assigned to one of the inputs.
A single input can activate several functions at the same time (reverse and 2nd ramp for example). **The user must therefore ensure that these functions are compatible**.

The SUP- display menu (parameters LIA and AIA on page 66) can be used to display the functions assigned to each input in order to check their compatibility.

List of functions which can be assigned to inputs/outputs

Logic inputs	Page	Code	Factory setting	
			ATV31●●●	ATV31●●●A
Not assigned	-	-	LI5 - LI6	LI1 - LI2 LI5 - LI6
Forward	-	-	LI1	
2 preset speeds	44	PS2	LI3	LI3
4 preset speeds	44	PS4	LI4	LI4
8 preset speeds	44	PS8		
16 preset speeds	45	PS16		
2 preset PI references	51	Pr2		
4 preset PI references	51	Pr4		
+ speed	48	USP		
- speed	48	dSP		
Jog operation	46	JOG		
Ramp switching	38	rPS		
Switching for 2nd current limit	55	LC2		
Fast stop via logic input	39	FSt		
DC injection via logic input	39	dC1		
Freewheel stop via logic input	40	nSt		
Reverse	23	rrS	LI2	
External fault	61	EtF		
RESET (fault reset)	60	rSF		
Forced local mode	63	FLO		
Reference switching	34	rFC		
Control channel switching	35	CCS		
Motor switching	56	CHP		
Limiting of forward motion (limit switch)	58	LAF		
Limiting of reverse motion (limit switch)	58	LAr		
Fault inhibit	62	InH		

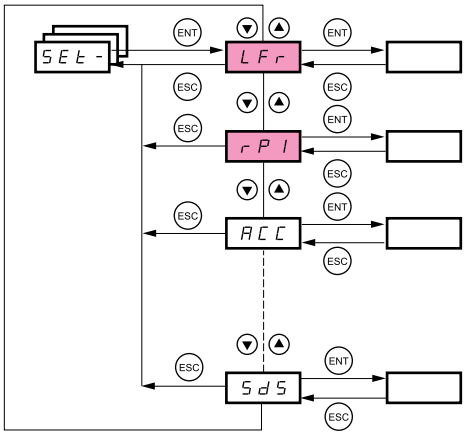
Analog inputs	Page	Code	Factory setting	
			ATV31●●●	ATV31●●●A
Not assigned	-	-	AI3	AI1 - AI3
Reference 1	33	Fr1	AI1	AIP (potentiometer)
Reference 2	33	Fr2		
Summing input 2	42	SA2	AI2	AI2
Summing input 3	42	SA3		
PI regulator feedback	51	PIF		

Analog/logic output	Page	Code	Factory setting
Not assigned	-	-	AOC/AOV
Motor current	24	OCr	
Motor frequency	24	rFr	
Motor torque	24	OLO	
Power supplied by the drive	24	OPr	
Drive fault (logic data)	24	FLt	
Drive running (logic data)	24	rUn	
Frequency threshold reached (logic data)	24	FtA	
High speed (HSP) reached (logic data)	24	FLA	
Current threshold reached (logic data)	24	CtA	
Frequency reference reached (logic data)	24	SrA	
Motor thermal threshold reached (logic data)	24	tSA	
Brake sequence (logic data)	54	bLC	

List of functions which can be assigned to inputs/outputs

Relay	Page	Code	Factory setting
Not assigned	-	-	R2
Drive fault	24	FLt	R1
Drive running	24	rUn	
Frequency threshold reached	24	FtA	
High speed (HSP) reached	24	FLA	
Current threshold reached	24	CtA	
Frequency reference reached	24	SrA	
Motor thermal threshold reached	24	tSA	
Brake sequence	54	bLC	

Settings menu SEt-



Speed reference via the terminal

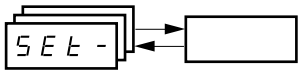
Spd parameter scale factor

The adjustment parameters can be modified with the drive running or stopped.

Check that it is safe to make changes during operation. Changes should preferably be made in stop mode.

These parameter appear regardless of how the other menus have been configured.

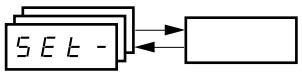
These parameters only appear if the corresponding function has been selected in another menu. When the corresponding function is also accessible and adjustable from within the configuration menu, to aid programming their description is detailed in these menus, on the pages indicated.

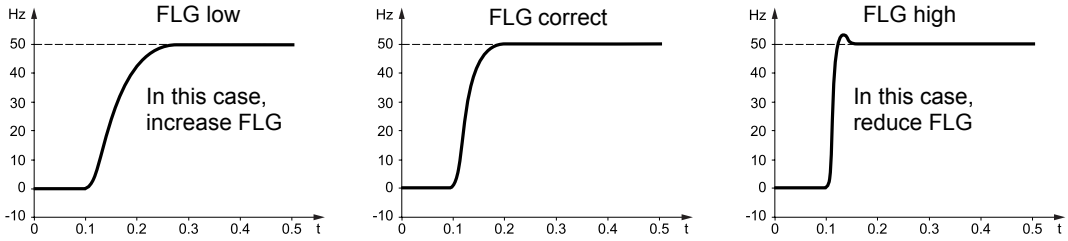
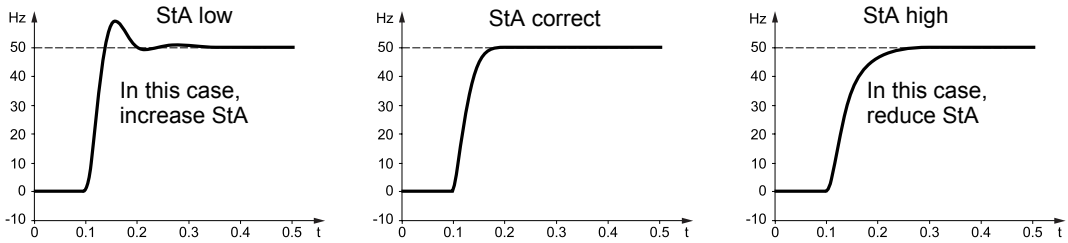


Code	Description		Adjustment range	Factory setting
LFr	**Speed reference via the remote terminal**		0 to HSP	
	This parameter appears if LCC = YES (page 35) or if Fr1/Fr2 = LCC (page 33), and if the remote terminal is online. In this case, LFr can also be accessed via the drive keypad. LFr is reset to 0 when the drive is powered down.			
rPI	**Internal PI regulator reference**	See page 51	0.0 to 100%	0
ACC	**Acceleration ramp time**		0.1 to 999.9 s	3 s
	Defined as the acceleration time between 0 and the nominal frequency FrS (parameter in the drC- menu).			
AC2	**2nd acceleration ramp time**	See page 38	0.1 to 999.9 s	5 s
dE2	**2nd deceleration ramp time**	See page 38	0.1 to 999.9 s	5 s
dEC	**Deceleration ramp time**		0.1 to 999.9 s	3 s
	Defined as the deceleration time between the nominal frequency FrS (parameter in the drC- menu) and 0. Check that the value of dEC is not too low in relation to the load to be stopped.			
tA1	**Start of CUS-type acceleration ramp rounded as % of total ramp time (ACC or AC2)**	See page 37	0 to 100	10%
tA2	**End of CUS-type acceleration ramp rounded as % of total ramp time (ACC or AC2)**	See page 37	0 to (100-tA1)	10%
tA3	**Start of CUS-type deceleration ramp rounded as % of total ramp time (dEC or dE2)**	See page 37	0 to 100	10%
tA4	**End of CUS-type deceleration ramp rounded as % of total ramp time (dEC or dE2)**	See page 37	0 to (100-tA3)	10%
LSP	**Low speed**		0 to HSP	0 Hz
	(Motor frequency at min. reference)			
HSP	**High speed**		LSP to tFr	bFr
	(Motor frequency to max. reference): Check that this setting is suitable for the motor and the application.			
ItH	**Motor thermal protection - max. thermal current**		0.2 to 1.5 In (1)	According to drive rating
	Set ItH to the nominal current on the motor rating plate. Please refer to OLL on page 61 if you wish to suppress thermal protection.			

(1) In corresponds to the nominal drive current indicated in the Installation Manual and on the drive rating plate.

Settings menu SEt-

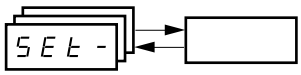


Code	Description	Adjustment range	Factory setting
UFr	**IR compensation/voltage boost**	0 to 100%	20
	- For UFt (page 21) = n or nLd: IR compensation - For UFt = L or P: Voltage boost Used to optimize the torque at very low speed (increase UFr if the torque is insufficient). Check that the value of UFr is not too high for when the motor is warm (risk of instability). ⚠ Modifying UFt (page 21) will cause UFr to return to the factory setting (20%).		
FLG	**Frequency loop gain**	1 to 100%	20
	Parameter can only be accessed if UFt (page 21) = n or nLd. The FLG parameter adjusts the drive's ability to follow the speed ramp based on the inertia of the machine being driven. Too high a gain may result in operating instability. 		
StA	**Frequency loop stability**	1 to 100%	20
	Parameter can only be accessed if UFt (page 21) = n or nLd. Used to adapt the return to steady state after a speed transient (acceleration or deceleration), according to the dynamics of the machine. Gradually increase the stability to avoid any overspeed. 		
SLP	**Slip compensation**	0 to 150%	100
	Parameter can only be accessed if UFt (page 21) = n or nLd. Used to adjust the slip compensation value fixed by nominal motor speed. The speeds given on motor rating plates are not necessarily exact. • If slip setting < actual slip: the motor is not rotating at the correct speed in steady state. • If slip setting > actual slip: the motor is overcompensated and the speed is unstable.		
IdC	**Level of DC injection braking current activated via logic input or selected as stop mode** (2). See page 39	0 to In (1)	0.7 In (1)
tdC	**Total DC injection braking time selected as stop mode** (2). See page 39	0.1 to 30 s	0.5 s
tdC1	**Automatic standstill DC injection time** See page 41	0.1 to 30 s	0.5 s
SdC1	**Level of automatic standstill DC injection current** See page 41	0 to 1.2 In (1)	0.7 In (1)
tdC2	**2nd automatic standstill DC injection time** See page 41	0 to 30 s	0 s
SdC2	**2nd level of standstill DC injection current** See page 41	0 to 1.2 In (1)	0.5 In (1)

(1) In corresponds to the nominal drive current indicated in the Installation Manual and on the drive rating plate.
(2) Caution: These settings are not related to the "automatic standstill DC injection" function.

These parameters only appear if the corresponding function has been selected in another menu. When the corresponding function is also accessible and adjustable from within the configuration menu, to aid programming their description is detailed in these menus, on the pages indicated.
Those which are underlined appear in factory settings mode.

Settings menu SEt-

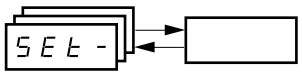


Code	Description		Adjustment range	Factory setting
JPF	**Skip frequency**		0 to 500	0 Hz
	Prevents prolonged operation at a frequency range of ± 1 Hz around JPF. This function prevents a critical speed which leads to resonance. Setting the function to 0 renders it inactive.			
JF2	**2nd skip frequency**		0 to 500	0 Hz
	Prevents prolonged operation at a frequency range of ± 1 Hz around JF2. This function prevents a critical speed which leads to resonance. Setting the function to 0 renders it inactive.			
JGF	**Jog operating frequency**	See page 46	0 to 10 Hz	10 Hz
rPG	**PI regulator proportional gain**	See page 51	0.01 to 100	1
rIG	**PI regulator integral gain**	See page 51	0.01 to 100/s	1/s
FbS	**PI feedback multiplication coefficient**	See page 51	0.1 to 100	1
PIC	**Reversal of the direction of correction of the PI regulator**	See page 51	nO - YES	nO
rP2	**2nd preset PI reference**	See page 51	0 to 100%	30%
rP3	**3rd preset PI reference**	See page 51	0 to 100%	60%
rP4	**4th preset PI reference**	See page 51	0 to 100%	90%
SP2	**2nd preset speed**	See page 45	0 to 500 Hz	10 Hz
SP3	**3rd preset speed**	See page 45	0 to 500 Hz	15 Hz
SP4	**4th preset speed**	See page 45	0 to 500 Hz	20 Hz
SP5	**5th preset speed**	See page 45	0 to 500 Hz	25 Hz
SP6	**6th preset speed**	See page 45	0 to 500 Hz	30 Hz
SP7	**7th preset speed**	See page 45	0 to 500 Hz	35 Hz
SP8	**8th preset speed**	See page 45	0 to 500 Hz	40 Hz
SP9	**9th preset speed**	See page 45	0 to 500 Hz	45 Hz
SP10	**10th preset speed**	See page 45	0 to 500 Hz	50 Hz
SP11	**11th preset speed**	See page 45	0 to 500 Hz	55 HZ
SP12	**12th preset speed**	See page 45	0 to 500 Hz	60 Hz
SP13	**13th preset speed**	See page 45	0 to 500 Hz	70 Hz
SP14	**14th preset speed**	See page 45	0 to 500 Hz	80 Hz
SP15	**15th preset speed**	See page 45	0 to 500 Hz	90 Hz
SP16	**16th preset speed**	See page 45	0 to 500 Hz	100 Hz
CL1	**Current limit**		0.25 to 1.5 In (1)	1.5 In (1)
	Used to limit the torque and the temperature rise of the motor.			
CL2	**2nd current limit**	See page 55	0.25 to 1.5 In (1)	1.5 In (1)
tLS	**Low speed operating time**		0 to 999.9 s	0 (no time limit)
	Following operation at LSP for a defined period, a motor stop is requested automatically. The motor restarts if the frequency reference is greater than LSP and if a run command is still present. Caution: Value 0 corresponds to an unlimited time			
rSL	**Restart error threshold** ("wake-up" threshold)	See page 52	0 to 100%	0
UFr2	**IR compensation, motor 2**	See page 57	0 to 100%	20
FLG2	**Frequency loop gain, motor 2**	See page 57	1 to 100%	20
StA2	**Stability, motor 2**	See page 57	1 to 100%	20
SLP2	**Slip compensation, motor 2**	See page 57	0 to 150%	100%

(1) In corresponds to the nominal drive current indicated in the Installation Manual and on the drive rating plate.

These parameters only appear if the corresponding function has been selected in another menu. When the corresponding function is also accessible and adjustable from within the configuration menu, to aid programming their description is detailed in these menus, on the pages indicated.
Those which are underlined appear in factory settings mode.

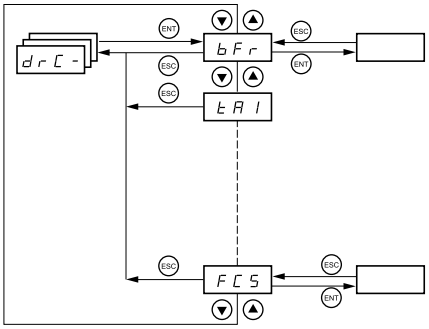
Settings menu SEt-



Code	Description	Adjustment range	Factory setting
Ftd	**Motor frequency threshold** above which the relay contact (R1 or R2 = FtA) closes or output AOV = 10 V (dO = StA)	0 to 500 Hz	bFr
ttd	**Motor thermal state threshold** above which the relay contact (R1 or R2 = tSA) closes or output AOV = 10 V (dO = tSA)	0 to 118%	100%
Ctd	**Motor current threshold** beyond which the relay contact (R1 or R2 = CtA) closes or output AOV = 10 V (dO = CtA)	0 to 1.5 In (1)	In (1)
SdS	**Scale factor for display parameter SPd1/SPd2/SPd3 (SUP- menu on page 65)**	0.1 to 200	30
	Used to scale a value in proportion to the output frequency rFr: the machine speed, the motor speed, etc. - If SdS ⩽ 1, SPd1 is displayed (possible definition = 0.01) - If 1 < SdS ⩽ 10, SPd2 is displayed (possible definition = 0.1) - If SdS > 10, SPd3 is displayed (possible definition = 1) - If SdS > 10 and SdS x rFr > 9999: Display of Spd3 = $\frac{\text{SdS x rFr}}{1000}$ to 2 decimal places Example: For 24 223, display is 24.22 - If SdS > 10 and SdS x rFr > 65535, display locked at 65.54 Example: Display motor speed for 4-pole motor, 1500 rpm at 50 Hz (synchronous speed): SdS = 30 SPd3 = 1500 at rFr = 50 Hz		
SFr	**Switching frequency** See page 22	2.0 to 16 kHz	4 kHz
	This parameter can also be accessed in the drC- menu.		

(1) In corresponds to the nominal drive current indicated in the Installation Manual and on the drive rating plate.

Motor control menu drC-



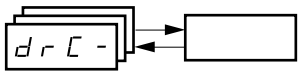
Standard motor frequency

Return to factory settings/restore configuration

With the exception of tUn, which can power up the motor, parameters can only be modified in stop mode, with no run command present.

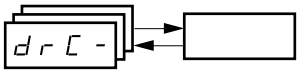
On the optional remote terminal, this menu can be accessed with the switch in the position.

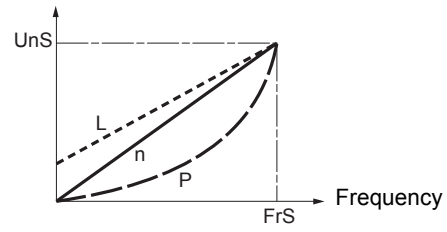
Drive performance can be optimized by:
- **Entering the values given on the motor rating plate in the drive menu**
- **Performing an auto-tune operation (on a standard asynchronous motor)**



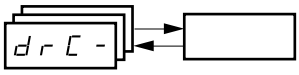
Code	Description	Adjustment range	Factory setting
bFr	**Standard motor frequency**		50
	50 Hz: IEC 60 Hz: NEMA This parameter modifies the presets of the following parameters: HSP page 16, Ftd page 19, FrS page 20 and tFr page 22.		
UnS	**Nominal motor voltage given on the rating plate**	According to drive rating	According to drive rating
	ATV31●●●M2: 100 to 240 V ATV31●●●M3X: 100 to 240 V ATV31●●●N4: 100 to 500 V ATV31●●●S6X: 100 to 600 V		
FrS	**Nominal motor frequency given on the rating plate**	10 to 500 Hz	50 Hz
	⚠ The ratio $\frac{\text{UnS (in volts)}}{\text{FrS (in Hz)}}$ must not exceed the following values: ATV31●●●M2: 7 max. ATV31●●●M3X: 7 max. ATV31●●●N4: 14 max. ATV31●●●S6X: 17 max. The factory setting is 50 Hz, or preset to 60 Hz if bFr is set to 60 Hz.		
nCr	**Nominal motor current given on the rating plate**	0.25 to 1.5 In (1)	According to drive rating
nSP	**Nominal motor speed given on the rating plate**	0 to 32760 RPM	According to drive rating
	0 to 9999 RPM then 10.00 to 32.76 KRPM If, rather than the nominal speed, the rating plate indicates the synchronous speed and the slip in Hz or as a %, calculate the nominal speed as follows: • Nominal speed = Synchronous speed x $\frac{100 - \text{slip as a \%}}{100}$ or • Nominal speed = Synchronous speed x $\frac{50 - \text{slip in Hz}}{50}$ (50 Hz motors) or • Nominal speed = Synchronous speed x $\frac{60 - \text{slip in Hz}}{60}$ (60 Hz motors)		
CoS	**Motor Cos Phi given on the rating plate**	0.5 to 1	According to drive rating

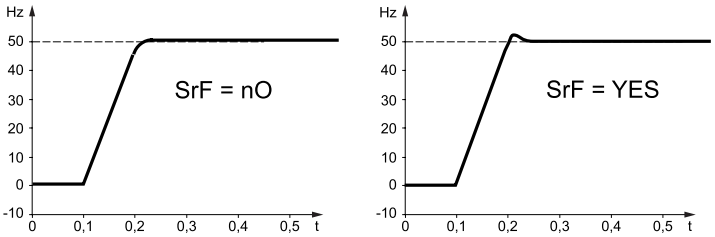
(1) In corresponds to the nominal drive current indicated in the Installation Manual and on the drive rating plate.



Code	Description	Adjustment range	Factory setting
rSC	**Cold state stator resistance**		nO
	nO: Function inactive. For applications which do not require high performance or do not tolerate automatic autotuning (passing a current through the motor) each time the drive is powered up. InIt: Activates the function. To improve low-speed performance whatever the thermal state of the motor. XXXX: Value of cold state stator resistance used, in mΩ. **Caution:** • **It is strongly recommended that this function is activated in Lifting and Handling applications.** • The function should only be activated (InIt) when the motor is in cold state. • When rSC = InIt, parameter tUn is forced to POn. At the next run command, the stator resistance is measured with an auto-tune. Parameter rSC then changes to this value (XXXX) and maintains it; tUn remains forced to POn. Parameter rSC remains at InIt as long as the measurement has not been performed. • Value XXXX can be forced or modified using the ▲ ▼ keys.		
tUn	**Motor control auto-tuning**		nO
	It is essential that all the motor parameters (UnS, FrS, nCr, nSP, COS) are configured correctly before performing auto-tuning. nO: Auto-tuning not performed. YES: Auto-tuning is performed as soon as possible, then the parameter automatically switches to dOnE or nO in the event of a fault (the tnF fault is displayed if tnL = YES (see page 62). dOnE: Use of the values given the last time auto-tuning was performed. rUn: Auto-tuning is performed every time a run command is sent. POn: Auto-tuning is performed on every power-up. LI1 to LI6: Auto-tuning is performed on the transition from 0 → 1 of a logic input assigned to this function. **Caution:** tUn is forced to POn if rSC is other than nO. Auto-tuning is only performed if no command has been activated. If a "freewheel stop" or "fast stop" function is assigned to a logic input, this input must be set to 1 (active at 0). Auto-tuning may last for 1 to 2 seconds. Do not interrupt; wait for the display to change to "dOnE" or "nO". ⚠ During auto-tuning the motor operates at nominal current.		
tUS	**Auto-tuning status** (information only, cannot be modified)		tAb
	tAb: The default stator resistance value is used to control the motor. PEnd: Auto-tuning has been requested but not yet performed. PrOG: Auto-tuning in progress FAIL: Auto-tuning has failed. dOnE: The stator resistance measured by the auto-tuning function is used to control the motor. Strd: The cold state stator resistance (rSC other than nO) that is used to control the motor.		
UFt	**Selection of the type of voltage/frequency ratio**		n
	L: Constant torque for motors connected in parallel or special motors P: Variable torque: pump and fan applications n: Sensorless flux vector control for constant torque applications nLd: Energy saving, for variable torque applications not requiring high dynamics (behaves in a similar way to the P ratio at no load and the n ratio on load) Voltage  		

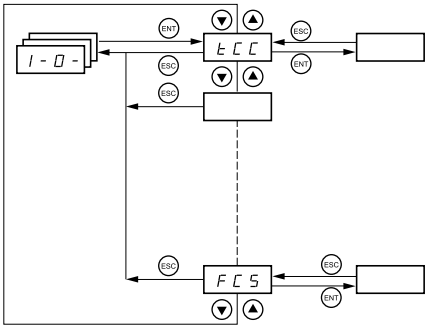
Motor control menu drC-



Code	Description	Adjustment range	Factory setting
nrd	**Random switching frequency**		YES
	YES: Frequency with random modulation nO: Fixed frequency Random frequency modulation prevents any resonance which may occur at a fixed frequency.		
SFr	**Switching frequency** (1)	2.0 to 16 kHz	4 kHz
	The frequency can be adjusted to reduce the noise generated by the motor. If the frequency has been set to a value higher than 4 kHz, in the event of an excessive rise in temperature, the drive will automatically reduce the switching frequency and increase it again once the temperature has returned to normal.		
tFr	**Maximum output frequency**	10 to 500 Hz	60 Hz
	The factory setting is 60 Hz, or preset to 72 Hz if bFr is set to 60 Hz.		
SrF	**Suppression of the speed loop filter**		nO
	nO: The speed loop filter is active (prevents the reference being exceeded). YES: The speed loop filter is suppressed (in position control applications, this reduces the response time and the reference may be exceeded).  		
SCS	**Saving the configuration** (1)		nO
	nO: Function inactive Str1: Saves the current configuration (but not the result of auto-tuning) to EEPROM. SCS automatically switches to nO as soon as the save has been performed. This function is used to keep another configuration in reserve, in addition to the current configuration. When drives leave the factory the current configuration and the backup configuration are both initialized with the factory configuration. • If the remote terminal option is connected to the drive, the following additional selection options will appear: FIL1, FIL2, FIL3, FIL4 (files available in the remote terminal's EEPROM memory for saving the current configuration). They can be used to store between 1 and 4 different configurations which can also be stored on or even transferred to other drives of the same rating. SCS automatically switches to nO as soon as the save has been performed.		
FCS	**Return to factory settings/restore configuration** (1)		nO
	nO: Function inactive rECI: The current configuration becomes identical to the backup configuration previously saved by SCS = Strl. rECI is only visible if the backup has been carried out. FCS automatically changes to nO as soon as this action has been performed. InI: The current configuration becomes identical to the **factory setting**. FCS automatically changes to nO as soon as this action has been performed. • If the remote terminal option is connected to the drive, the following additional selection options appear, as long as the corresponding files have been loaded in the remote terminal's EEPROM memory (0 to 4 files): FIL1, FIL2, FIL3, FIL4. They enable the current configuration to be replaced with one of the 4 configurations which may be loaded on the remote terminal. FCS automatically changes to nO as soon as this action has been performed. **Caution:** If nAd appears on the display briefly once the parameter has switched to nO, this means that the configuration transfer is not possible and has not been performed (different drive ratings for example). If nEr appears on the display briefly once the parameter has switched to nO, this means that a configuration transfer error has occurred and the factory settings must be restored using InI. In both cases, check the configuration to be transferred before trying again. ⚠ For rECI, InI and FL1 to FL4 to be taken into account, the ENT key must be held down for 2 s.		

(1) SCS and FCS can be accessed via several configuration menus but they concern all menus and parameters as a whole.
(2) Parameter can also be accessed in the settings menu (SEt-).

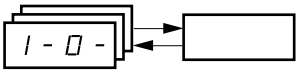
I/O menu I-O-

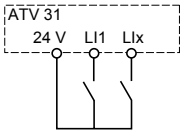
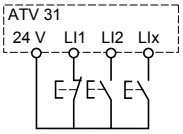


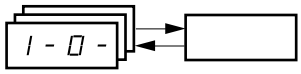
2-wire/3-wire control

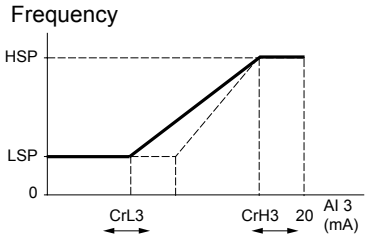
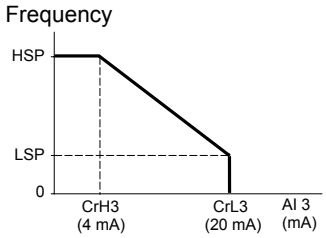
Return to factory settings/restore configuration

The parameters can only be modified when the drive is stopped and no run command is present.
On the optional remote terminal, this menu can be accessed with the switch in the position.

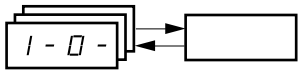


Code	Description	Factory setting
tCC	**2-wire/3-wire control (Type of control)**	2C ATV31●●●A: LOC
	Control configuration: 2C = 2-wire control 3C = 3-wire control LOC = local control (drive RUN/STOP/RESET) for ATV31●●●A only (invisible if LAC = L3, see page 33). 2-wire control: The open or closed state of the input controls running or stopping. Wiring example: LI1: forward LIx: reverse  3-wire control (pulse control): A "forward" or "reverse" pulse is sufficient to control starting, a "stop" pulse is sufficient to control stopping. Example of wiring: LI1: stop LI2: forward LIx: reverse  ⚠ To change the assignment of tCC press the "ENT" key for 2 s. This causes the following functions to return to their factory setting: rrS, tCt and all functions affecting logic inputs.	
tCt	**Type of 2-wire control** (parameter only accessible if tCC = 2C)	trn
	LEL: State 0 or 1 is taken into account for run or stop. trn: A change of state (transition or edge) is necessary to initiate operation, in order to prevent accidental restarts after a break in the power supply. PFO: State 0 or 1 is taken into account for run or stop, but the "forward" input always takes priority over the "reverse" input.	
rrS	**Reverse operation via logic input**	if tCC = 2C: LI2 if tCC = 3C: LI3 if tCC = LOC: nO
	If rrS = nO, reverse operation is active, by means of negative voltage on AI2 for example. nO: Not assigned LI2: Logic input LI2, can be accessed if tCC = 2C LI3: Logic input LI3 LI4: Logic input LI4 LI5: Logic input LI5 LI6: Logic input LI6	



Code	Description	Factory setting
CrL3 CrH3	**Value for low speed (LSP) on input AI3**, can be set between 0 and 20 mA **Value for high speed (HSP) on input AI3**, can be set between 4 and 20 mA	4 mA 20 mA
	These two parameters are used to configure the input for 0-20 mA, 4-20 mA, 20-4 mA, etc.  Example: 20 - 4 mA 	
AOIt	**Configuration of the analog output**	0A
	0A: 0 - 20 mA configuration (use terminal AOC) 4A: 4 - 20 mA configuration (use terminal AOC) 10U: 0 - 10 V configuration (use terminal AOV)	
dO	**Analog/logic output AOC/AOV**	nO
	nO: Not assigned OCr: Motor current. 20 mA or 10 V corresponds to twice the nominal drive current. OFr: Motor frequency. 20 mA or 10 V corresponds to the maximum frequency tFr (page 22). Otr: Motor torque. 20 mA or 10 V corresponds to twice the nominal motor torque. OPr: Power supplied by the drive. 20 mA or 10 V corresponds to twice the nominal drive power. Making the following assignments (1) will transform the analog output to a logic output (see the diagram in the Installation Manual): FLt: Drive fault rUn: Drive running FtA: Frequency threshold reached (Ftd parameter in the SEt- menu, page 19) FLA: High speed (HSP) reached CtA: Current threshold reached (Ctd parameter in the SEt- menu, page 19) SrA: Frequency reference reached tSA: Motor thermal threshold reached (ttd parameter in the SEt- menu, page 19) bLC: Brake sequence (for information, as this assignment can be only be activated or deactivated from the FUn- menu, see page 54) APL: Loss of 4-20 mA signal, even if LFL = nO (page 62) The logic output is in state 1 (24 V) when the selected assignment is active, with the exception of FLt (state 1 if the drive is not faulty). ⚠ (1) With these assignments, **configure AOt = 0A.**	
r1	**Relay r1**	FLt
	nO: Not assigned FLt: Drive fault rUn: Drive running FtA: Frequency threshold reached (Ftd parameter in the SEt- menu, page 19) FLA: High speed (HSP) reached CtA: Current threshold reached (Ctd parameter in the SEt- menu, page 19) SrA: Frequency reference reached tSA: Motor thermal threshold reached (ttd parameter in the SEt- menu, page 19) APL: Loss of 4-20 mA signal, even if LFL = nO (page 62) The relay is powered up when the selected assignment is active, with the exception of FLt (powered up if the drive is not faulty).	
r2	**Relay r2**	nO
	nO: Not assigned FLt: Drive fault rUn: Drive running FtA: Frequency threshold reached (Ftd parameter in the SEt- menu, page 19) FLA: High speed (HSP) reached CtA: Current threshold reached (Ctd parameter in the SEt- menu, page 19) SrA: Frequency reference reached tSA: Motor thermal threshold reached (ttd parameter in the SEt- menu, page 19) bLC: Brake sequence (for information, as this assignment can be only be activated or deactivated from the FUn- menu, see page 54) APL: Loss of 4-20 mA signal, even if LFL = nO (page 62) The relay is powered up when the selected assignment is active, with the exception of FLt (powered up if the drive is not faulty).	

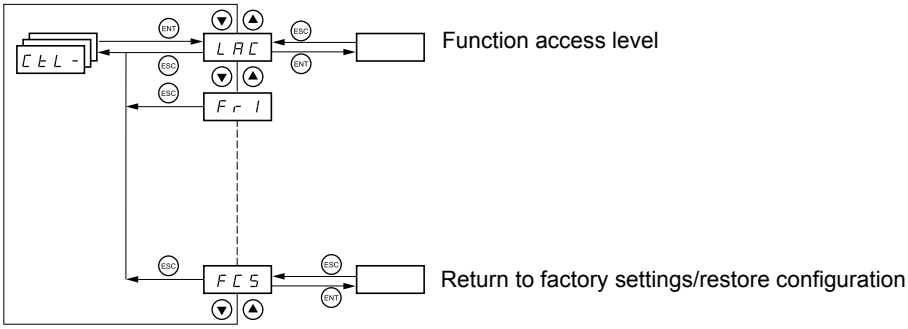
I/O menu I-O-



Code	Description	Factory setting
SCS	**Saving the configuration** (1)	
	nO: Function inactive Str I: Saves the current configuration (but not the result of auto-tuning) to EEPROM. SCS automatically switches to nO as soon as the save has been performed. This function is used to keep another configuration in reserve, in addition to the current configuration. When drives leave the factory the current configuration and the backup configuration are both initialized with the factory configuration. • If the remote terminal option is connected to the drive, the following additional selection options will appear: FIL 1, FIL 2, FIL 3, FIL 4 (files available in the remote terminal's EEPROM memory for saving the current configuration). They can be used to store between 1 and 4 different configurations which can also be stored on or even transferred to other drives of the same rating. SCS automatically switches to nO as soon as the save has been performed.	
FCS	**Return to factory settings/restore configuration** (1)	
	nO: Function inactive rECI: The current configuration becomes identical to the backup configuration previously saved by SCS = StrI. rECI is only visible if the backup has been carried out. FCS automatically changes to nO as soon as this action has been performed. InI: The current configuration becomes identical to the **factory setting**. FCS automatically changes to nO as soon as this action has been performed. • If the remote terminal option is connected to the drive, the following additional selection options appear, as long as the corresponding files have been loaded in the remote terminal's EEPROM memory (0 to 4 files): FIL 1, FIL 2, FIL 3, FIL 4. They enable the current configuration to be replaced with one of the 4 configurations that may be loaded on the remote terminal. FCS automatically changes to nO as soon as this action has been performed. **Caution:** If nAd appears on the display briefly once FCS has switched to nO, this means that the configuration transfer is not possible and has not been performed (different drive ratings for example). If nEr appears on the display briefly once the parameter has switched to nO, this means that a configuration transfer error has occurred and the factory settings must be restored using InI. In both cases, check the configuration to be transferred before trying again. ⚠ For rECI, InI and FL1 to FL4 to be taken into account, the ENT key must be held down for 2 s.	

(1) SCS and FCS can be accessed via several configuration menus but they concern all menus and parameters as a whole.

Control menu CtL-



The parameters can only be modified when the drive is stopped and no run command is present.
On the optional remote terminal, this menu can be accessed with the switch in the position.

Control and reference channels

Run commands (forward, reverse, etc.) and references can be sent using the following methods:

Command CMD	Reference rFr
tEr: Terminal (LI.)	AI1-AI2-AI3: Terminal
LOC: Keypad (RUN/STOP) on ATV31●●●A only	AIP: Potentiometer on ATV31●●●A only
LCC: Remote terminal (RJ45 socket)	LCC: ATV31 keypad or ATV31●●●A keypad or remote terminal
Mdb: Modbus (RJ45 socket)	Mdb: Modbus (RJ45 socket)
CAn: CANopen (RJ45 socket)	CAn: CANopen (RJ45 socket)

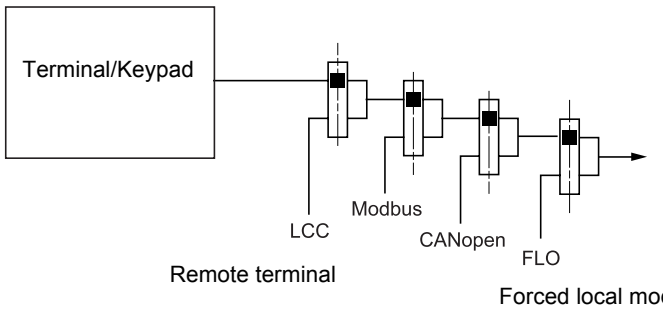
Note:
The STOP keys on the keypad and the remote terminal may retain priority (PSt parameter in the CtL- menu).

The LAC parameter in the CtL- menu can be used to select priority modes for the control and reference channels. It has 3 function levels:

- LAC = L1: Basic functions, with priority via communication bus. **This level is interchangeable with ATV28**.
- LAC = L2: Provides the option of additional functions compared with L1:
  - +/- speed (motorized potentiometer)
  - Brake control
  - Switching for 2nd current limit
  - Motor switching
  - Management of limit switches
- LAC = L3: Same options as with L2, plus mixed mode for control and reference channels.

These channels can be combined as follows if parameter LAC = L1 or L2.

Highest priority to lowest priority: Local forcing, CANopen, Modbus, Remote terminal, Terminal/Keypad (from right to left in the diagram below).

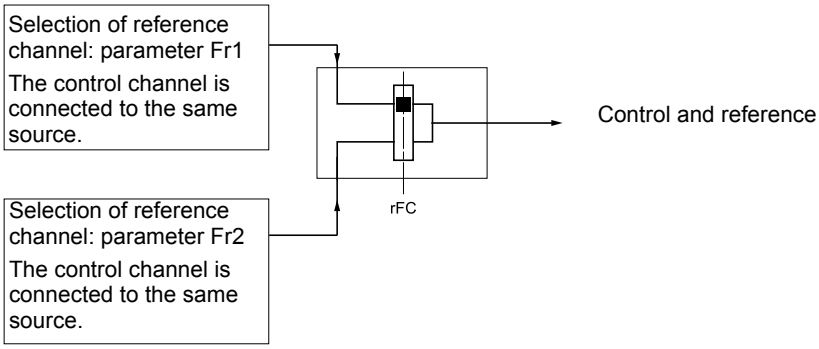


See the detailed diagrams on pages 28 and 29.

- On ATV31 drives, in factory settings mode, control and reference are managed by the terminal.
- On ATV31●●●A drives, in factory settings mode, control is via the keypad and the reference is set via the potentiometer for this keypad.
- With a remote terminal, if LCC = YES (CtL- menu), control and reference are managed by the remote terminal (reference via LFr, SEt- menu).

These channels can be combined in other ways described below if LAC = L3.

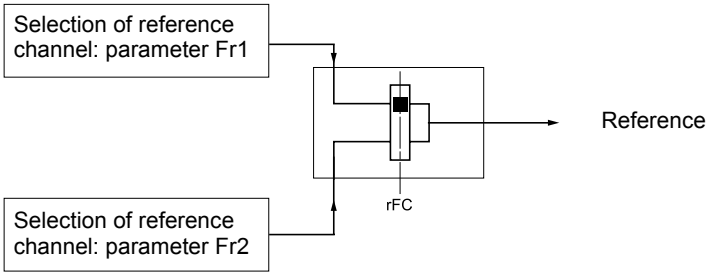
Combined control and reference (parameter CHCF = SIM):


Selection of reference channel: parameter Fr1
The control channel is connected to the same source.
Selection of reference channel: parameter Fr2
The control channel is connected to the same source.
rFC
Control and reference

Parameter rFC can be used to select channel Fr1 or Fr2 or to configure a logic input or a control word bit for remote switching of either.
See the detailed diagrams on pages 30 et 32.

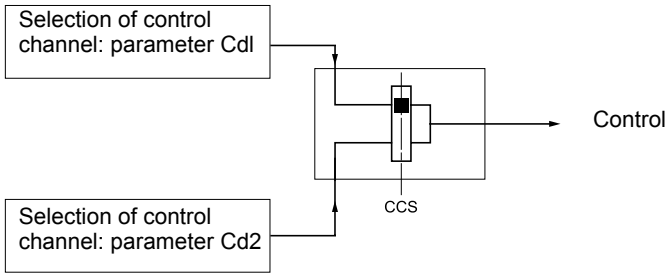
Separate control and reference (parameter CHCF = SEP):

Reference



Parameter rFC can be used to select channel Fr1 or Fr2 or to configure a logic input or a control word bit for remote switching of either.

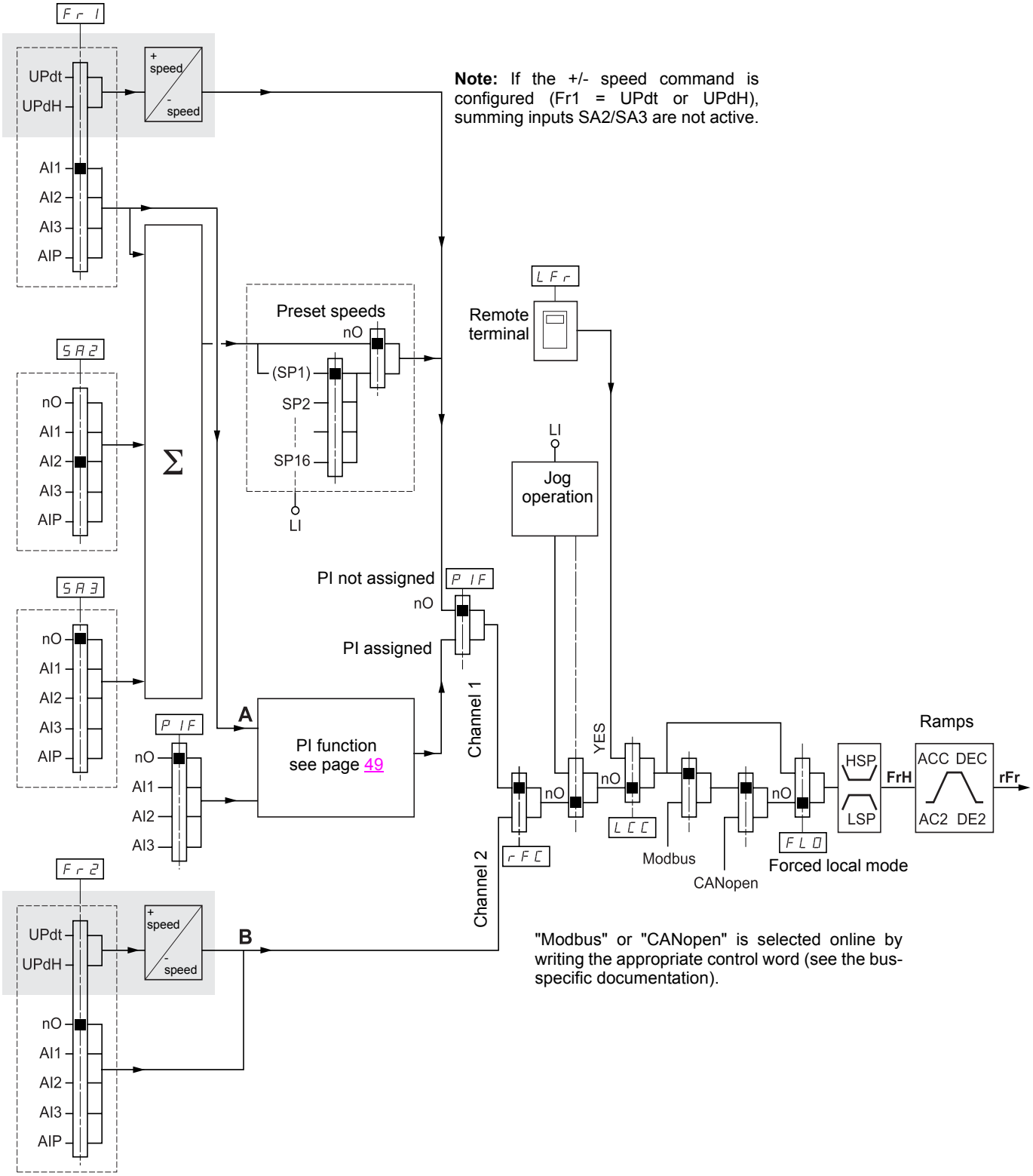
Control



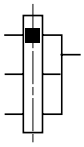
Parameter CCS can be used to select channel Cd1 or Cd2 or to configure a logic input or a control word bit for remote switching of either.

See the detailed diagrams on pages 30 and 31.

Reference channel for LAC = L1 or L2



Key:

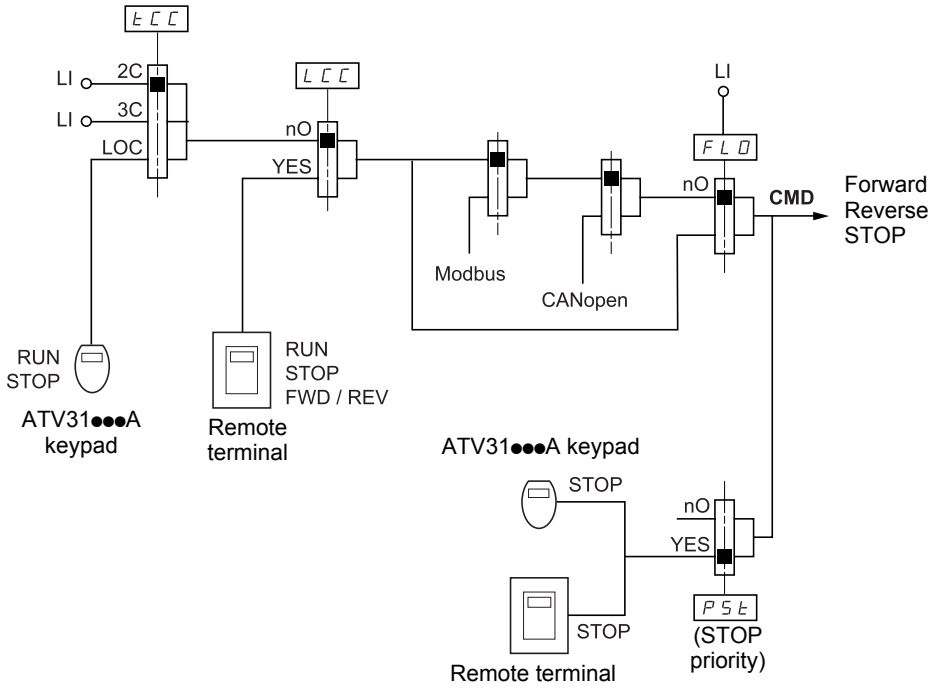


Parameter:
The black square represents the factory setting assignment

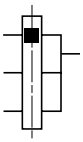
Function accessible for LAC = L2

Control channel for LAC = L1 or L2

Parameters FLO, LCC and the selection of the Modbus or CANopen bus are common to the reference and control channels.
Example: LCC = YES sets the drive to control **and** reference via the remote terminal.

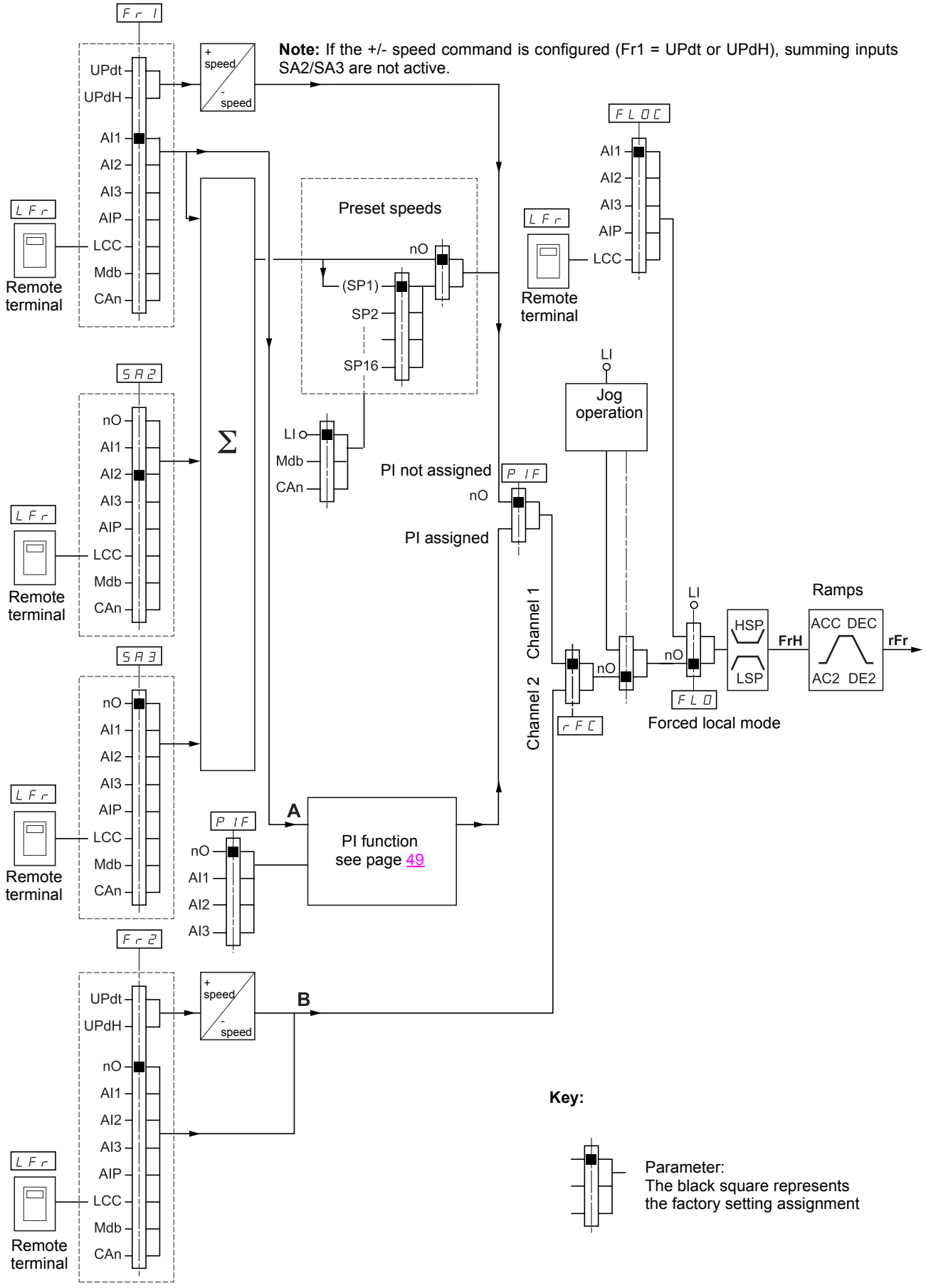


Key:



Parameter:
The black square represents
the factory setting assignment

Reference channel for LAC = L3

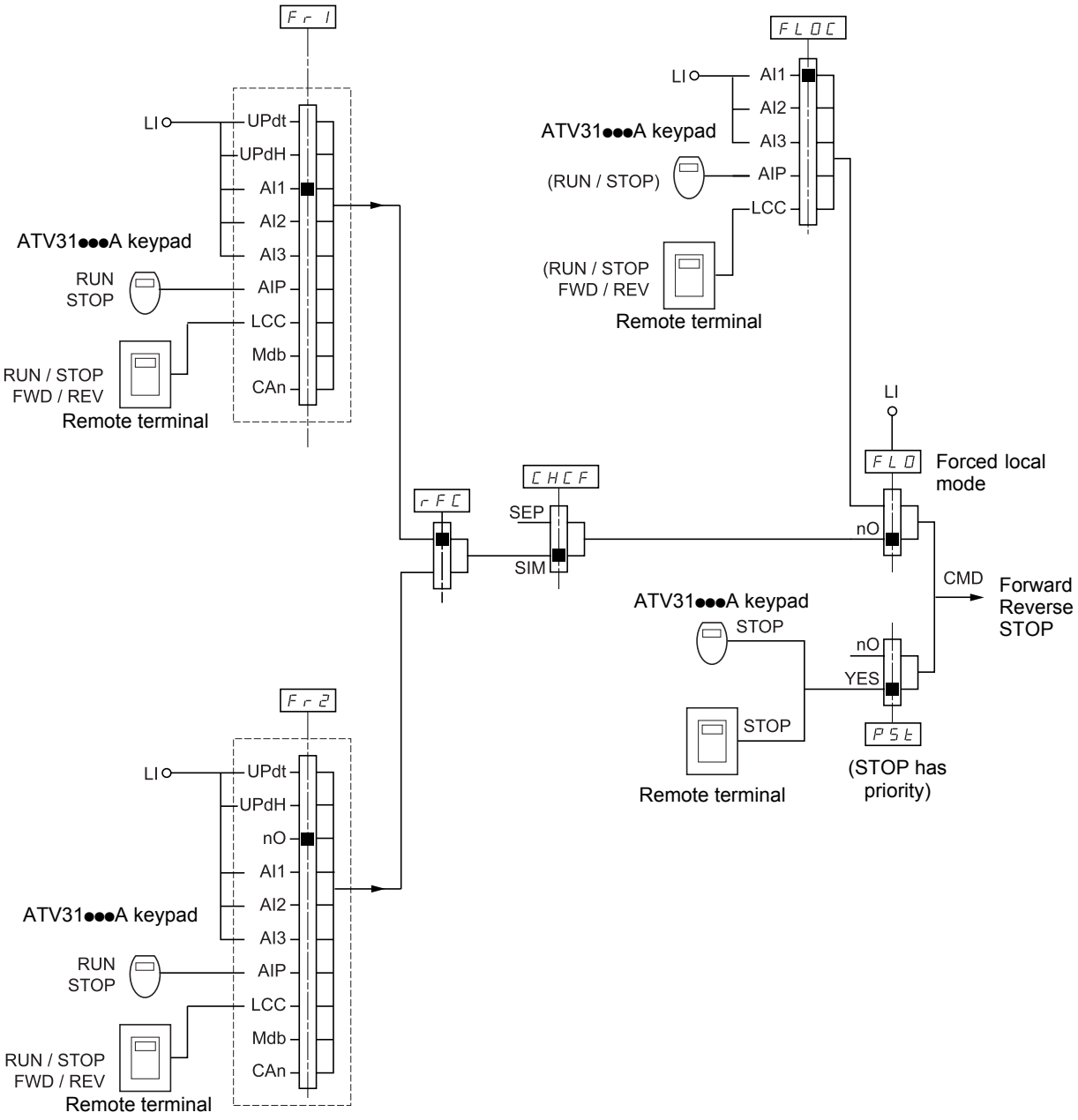


Control channel for LAC = L3

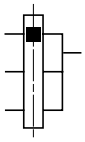
Combined reference and control

Parameters Fr1, Fr2, rFC, FLO and FLOC are common to reference and control. The control channel is therefore determined by the reference channel.

Example: If reference Fr1 = AI1 (analog input on terminal block) control is via LI (logic input on terminal block)..



Key:

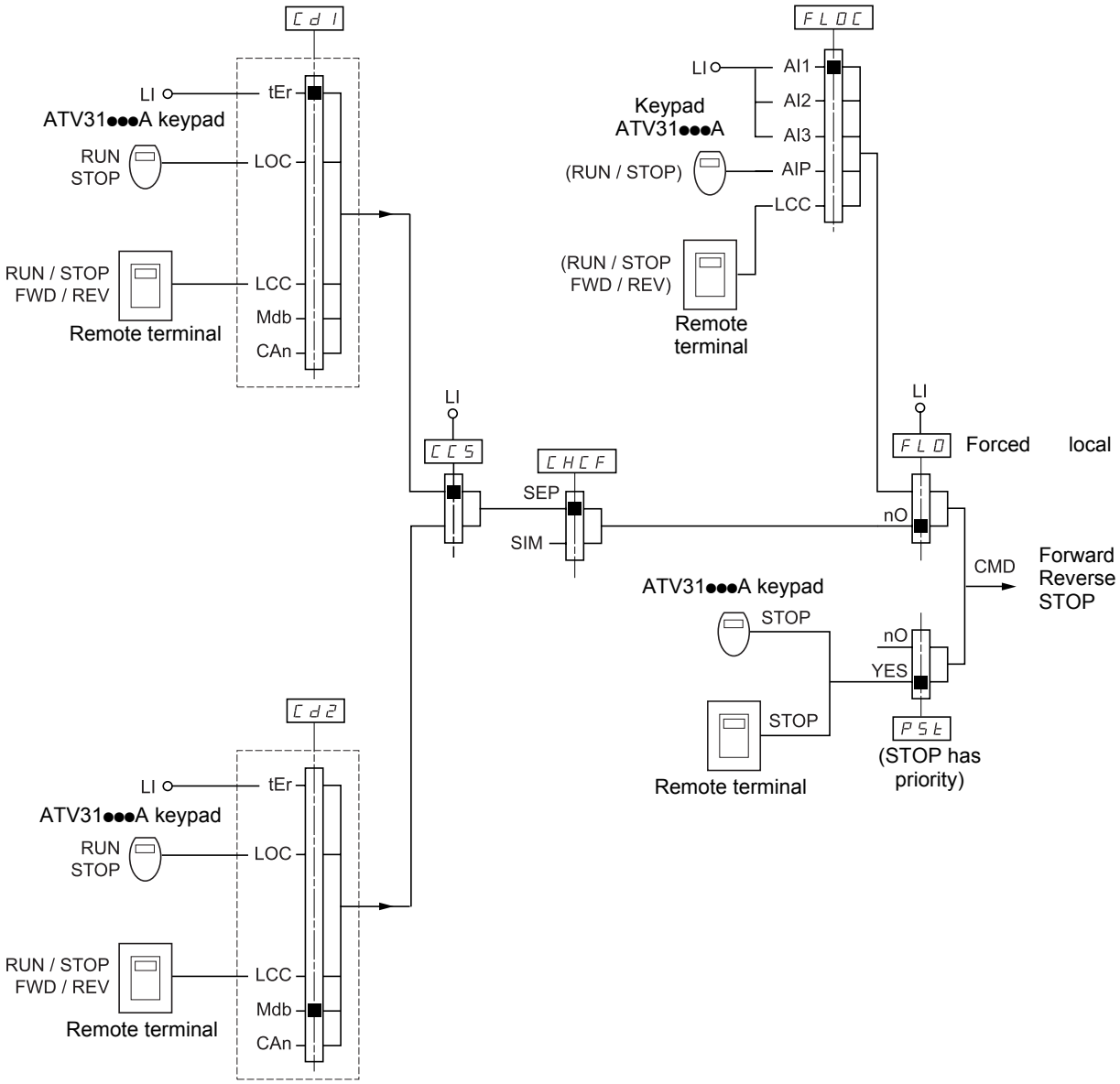


Parameter:
The black square represents
the factory setting assignment

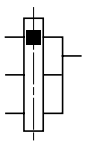
Control channel for LAC = L3

Mixed mode (separate reference and control)

Parameters FLO and FLOC are common to reference and control.
Example: If the reference is in local forced mode via AI1 (analog input on terminal block) control in local forced mode is via LI (logic input on terminal block).



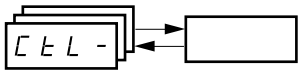
Key:



Parameter:
The black square represents
the factory setting assignment

Control menu CtL-

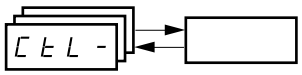
There may be an incompatibility between functions (see the incompatibility table 13). In this case, the first function configured will prevent the remainder being configured.



Code	Description	Adjustment range	Factory setting
LAC	**Function access level**		L1
	L1: Access to standard functions. Significantly, this level is interchangeable with ATV28. L2: Access to advanced functions in the FUn- menu: - +/- speed (motorized potentiometer) - Brake control - Switching for second current limit - Motor switching - Management of limit switches L3: Access to advanced functions and management of mixed control modes. **Assigning LAC to L3 will restore the factory settings of the Fr1 (below), Cd1 (page 34), CHCF (page 34), and tCC (page 23) parameters. The latter is forced to "2C" on ATV31●●●A. L3 can only be restored to L2 or L1 and L2 to L1 by means of a "factory setting" via FCS (page 36).** In order to change the assignment of LAC, you must press and hold down the "ENT" key for 2 seconds.		
Fr1	**Configuration reference 1**		AI1 AIP for ATV31●●●A
	AI1: Analog input AI1 AI2: Analog input AI2 AI3: Analog input AI3 AIP: Potentiometer (ATV31●●●A only) If LAC = L2 or L3, the following additional assignments are possible: UPdt: (1) + speed/- speed via LI UPdH: (1) + speed/- speed via keys ▲▼ on the ATV31 or ATV31●●●A keypad or remote terminal. For operation, display the frequency rFr (see page 65) If LAC = L3, the following additional assignments are possible: LCC: Reference via the remote terminal, LFr parameter in the SEt- menu page 16. Mdb: Reference via Modbus CAn: Reference via CANopen		
Fr2	**Configuration reference 2**		nO
	nO: Not assigned AI1: Analog input AI1 AI2: Analog input AI2 AI3: Analog input AI3 AIP: Potentiometer (ATV31●●●A only) If LAC = L2 or L3, the following additional assignments are possible: UPdt: (1) + speed/- speed via LI UPdH: (1) + speed/- speed via keys ▲▼ on the ATV31 or ATV31●●●A keypad or remote terminal. For operation, display the frequency rFr (see page 65) If LAC = L3, the following additional assignments are possible: LCC: Reference via the remote terminal, LFr parameter in the SEt- menu page 16. Mdb: Reference via Modbus CAn: Reference via CANopen		

(1) Caution: You cannot assign UPdt to Fr1 or Fr2 and UPdH to Fr1 or Fr2 at the same time. Only one of the UPdt/UPdH assignments is permitted on each reference channel.

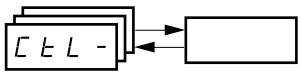
Control menu CtL-



Code	Description	Adjustment range	Factory setting
rFC	**Reference switching**		Fr1
	Parameter rFC can be used to select channel Fr1 or Fr2 or to configure a logic input or a control bit for remote switching of Fr1 or Fr2. Fr1: Reference = Reference 1 Fr2: Reference = Reference 2 LI1: Logic input LI1 LI2: Logic input LI2 LI3: Logic input LI3 LI4: Logic input LI4 LI5: Logic input LI5 LI6: Logic input LI6 If LAC = L3, the following additional assignments are possible: C111: Bit 11 of the Modbus control word C112: Bit 12 of the Modbus control word C113: Bit 13 of the Modbus control word C114: Bit 14 of the Modbus control word C115: Bit 15 of the Modbus control word C211: Bit 11 of the CANopen control word C212: Bit 12 of the CANopen control word C213: Bit 13 of the CANopen control word C214: Bit 14 of the CANopen control word C215: Bit 15 of the CANopen control word The reference can be switched with the drive running. Fr1 is active when the logic input or control word bit is in state 0. Fr2 is active when the logic input or control word bit is in state 1.		
CHCF	**Mixed mode** (control channels separated from reference channels)		SIM
	Can be accessed if LAC = L3 SIM: Combined SEP: Separate		
Cd1	**Configuration of control channel 1**		tEr LOC for ATV31●●●A
	Can be accessed if CHCF = SEP and LAC = L3 tEr: Terminal block control LOC: Keypad control (ATV31●●●A only) LCC: Remote terminal control Mdb: Control via Modbus CAn: Control via CAN		
Cd2	**Configuration of control channel 2**		Mdb:
	Can be accessed if CHCF = SEP and LAC = L3 tEr: Terminal block control LOC: Keypad control (ATV31●●●A only) LCC: Remote terminal control Mdb: Control via Modbus CAn: Control via CAN		

These parameters only appear if the function has been enabled.

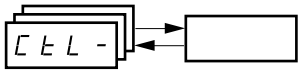
Control menu CtL-



Code	Description	Adjustment range	Factory setting
CCS	**Control channel switching**		Cd1
	Can be accessed if CHCF = SEP and LAC = L3 Parameter CCS can be used to select channel Cd1 or Cd2 or to configure a logic input or a control bit for remote switching of Cd1 or Cd2. Cd 1: Control channel = Channel 1 Cd2: Control channel = Channel 2 LI1: Logic input LI1 LI2: Logic input LI2 LI3: Logic input LI3 LI4: Logic input LI4 LI5: Logic input LI5 LI6: Logic input LI6 C111: Bit 11 of the Modbus control word C112: Bit 12 of the Modbus control word C113: Bit 13 of the Modbus control word C114: Bit 14 of the Modbus control word C115: Bit 15 of the Modbus control word C211: Bit 11 of the CANopen control word C212: Bit 12 of the CANopen control word C213: Bit 13 of the CANopen control word C214: Bit 14 of the CANopen control word C215: Bit 15 of the CANopen control word Channel 1 is active when the input or control word bit is in state 0. Channel 2 is active when the input or control word bit is in state 1.		
COP	**Copy channel 1 to channel 2** (copy only in this direction)		nO
	Can be accessed if LAC = L3 nO: No copy SP: Copy reference Cd: Copy control ALL: Copy control and reference • If channel 2 is controlled via the terminal block, channel 1 control is not copied. • If channel 2 reference is set via AI1, AI2, AI3 or AIP, channel 1 reference is not copied. • The reference copied is FrH (before ramp) unless the channel 2 reference is set via +/- speed. In this case, the reference copied is rFr (after ramp) ⚠ - Copying the control and/or the reference may change the direction of rotation.		
LCC	**Control via remote terminal**		nO
	Parameter can only be accessed with the remote terminal option and if LAC = L1 or L2. nO: Function inactive YES: Enables control of the drive using the STOP/RESET, RUN and FWD/REV buttons on the terminal. The speed reference is then given by parameter LFr in the SEt- menu. Only the freewheel, fast stop and DC injection stop commands remain active on the terminal block. If the drive/terminal connection is cut or if the terminal has not been connected, the drive locks in an SLF fault.		
PSt	**Stop priority**		YES
	This function gives priority to the STOP key on the keypad (ATV31●●●A only) or the STOP key on the remote terminal, regardless of the control channel (terminal block or communication bus). nO: Function inactive YES: STOP key priority In order to change the assignment of PSt, you must press and hold down the "ENT" key for 2 seconds.		
rOt	**Direction of operation authorized**		dFr
	Direction of operation authorized for the RUN key on the keypad (ATV31●●●A only) or the RUN key on the remote terminal. dFr: Forward drS: Reverse bOt: Both directions are authorized (except for the keypad on the ATV31●●●A: Forward only).		

These parameters only appear if the function has been enabled.

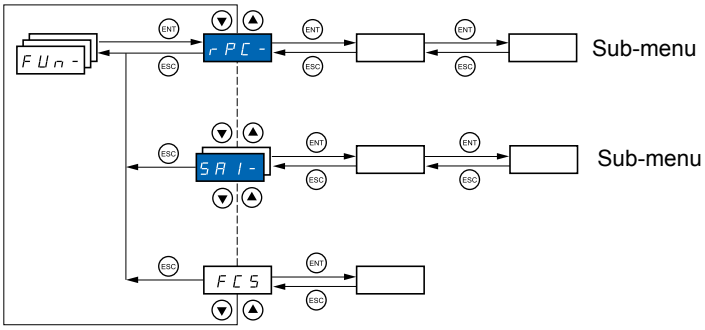
Control menu CtL-



Code	Description	Adjustment range	Factory setting
SCS	**Saving the configuration** (1)		
	nO: Function inactive Str I: Saves the current configuration (but not the result of auto-tuning) to EEPROM. SCS automatically switches to nO as soon as the save has been performed. This function is used to keep another configuration in reserve, in addition to the current configuration. When drives leave the factory the current configuration and the backup configuration are both initialized with the factory configuration. • If the remote terminal option is connected to the drive, the following additional selection options will appear: FIL I, FIL 2, FIL 3, FIL 4 (files available in the remote terminal's EEPROM memory for saving the current configuration). They can be used to store between 1 and 4 different configurations which can also be stored on or even transferred to other drives of the same rating. SCS automatically switches to nO as soon as the save has been performed.		
FCS	**Return to factory settings/Restore configuration** (1)		
	nO: Function inactive rECI: The current configuration becomes identical to the backup configuration previously saved by SCS = StrI. rECI is only visible if the backup has been carried out. FCS automatically changes to nO as soon as this action has been performed. InI: The current configuration becomes identical to the **factory setting**. FCS automatically changes to nO as soon as this action has been performed. • If the remote terminal option is connected to the drive, the following additional selection options appear, as long as the corresponding files have been loaded in the remote terminal's EEPROM memory (0 to 4 files): FIL I, FIL 2, FIL 3, FIL 4. They enable the current configuration to be replaced with one of the 4 configurations that may be loaded on the remote terminal. FCS automatically changes to nO as soon as this action has been performed. **Caution:** If nAd appears on the display briefly once FCS has switched to nO, this means that the configuration transfer is not possible and has not been performed (different drive ratings for example). If nEr appears on the display briefly once the parameter has switched to nO, this means that a configuration transfer error has occurred and the factory settings must be restored using InI. In both cases, check the configuration to be transferred before trying again. ⚠ For rECI, InI and FL1 to FL4 to be taken into account, the ENT key must be held down for 2 s.		

(1) SCS and FCS can be accessed via several configuration menus but they concern all menus and parameters as a whole.

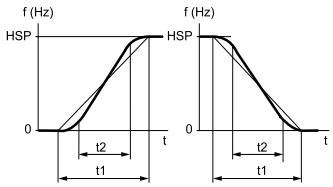
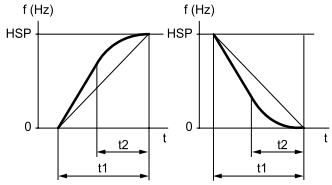
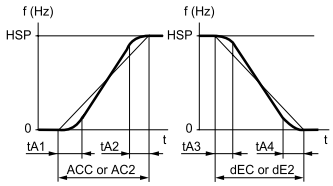
Application functions menu FUn-



The parameters can only be modified when the drive is stopped and no run command is present.
On the optional remote terminal, this menu can be accessed with the switch in the position.

Some functions have numerous parameters. In order to clarify programming and avoid having to scroll through endless parameters, these functions have been grouped in sub-menus.
Like menus, sub-menus are identified by a dash after their code: PSS- for example.

There may be an incompatibility between functions (see the incompatibility table 13). In this case, the first function configured will prevent the remainder being configured.

Code		Description	Adjustment range	Factory setting
rPC-		**Ramps**		
	rPt	**Type of ramp** Defines the shape of the acceleration and deceleration ramps.		LIn
		LIn: Linear S: S ramp U: U ramp CUS: Customized S ramps  The curve coefficient is fixed, with t2 = 0.6 x t1 with t1 = set ramp time. U ramps  The curve coefficient is fixed, with t2 = 0.5 x t1 with t1 = set ramp time. Customized ramps  tA1: Can be set between 0 and 100% (of ACC or AC2) tA2: Can be set between 0 and (100% - tA1) (of ACC or AC2) tA3: Can be set between 0 and 100% (of dEC or dE2) tA4: Can be set between 0 and (100% - tA3) (of dEC or dE2)		
	tA1	**Start of CUS-type acceleration ramp rounded as % of total ramp time (ACC or AC2)**	0 to 100	10%

These parameters only appear if the function has been enabled.

Code		Description	Adjustment range	Factory setting
rPC - (continued)	tA2	**End of CUS-type acceleration ramp rounded as % of total ramp time (ACC or AC2)**	0 to (100-tA1)	10%
	tA3	**Start of CUS-type deceleration ramp rounded as % of total ramp time (dEC or dE2)**	0 to 100	10%
	tA4	**End of CUS-type deceleration ramp as % of total ramp time (dEC or dE2)**	0 to (100-tA3)	10%
	ACC dEC	**Acceleration and deceleration ramp times** (1)	0.1 to 999.9 s 0.1 to 999.9 s	3 s 3 s
		Defined for accelerating and decelerating between 0 and the nominal frequency FrS (parameter in the drC- menu). Check that the value of dEC is not too low in relation to the load to be stopped.		
	rPS	**Ramp switching**		nO
		This function remains active regardless of the control channel. nO: Not assigned LI1: Logic input LI1 LI2: Logic input LI2 LI3: Logic input LI3 LI4: Logic input LI4 LI5: Logic input LI5 LI6: Logic input LI6 If LAC = L3, the following assignments are possible: Cd11: Bit 11 of the Modbus or CANopen control word Cd12: Bit 12 of the Modbus or CANopen control word Cd13: Bit 13 of the Modbus or CANopen control word Cd14: Bit 14 of the Modbus or CANopen control word Cd15: Bit 15 of the Modbus or CANopen control word ACC and dEC are enabled when the logic input or control word bit is in state 0. AC2 and dE2 are enabled when the logic input or control word bit is in state 1.		
	Frt	**Ramp switching threshold**	0 to 500 Hz	0
		The second ramp is switched if the value of Frt is not equal to 0 (0 deactivates the function) and the output frequency is greater than Frt. Threshold ramp switching can be combined with switching via LI or bit as follows:		
	AC2	**2nd acceleration ramp time** (1): Enabled via logic input (rPS) or frequency threshold (Frt).	0.1 to 999.9 s	5 s
	dE2	**2nd deceleration ramp time** (1): Enabled via logic input (rPS) or frequency threshold (Frt).	0.1 to 999.9 s	5 s
	brA	**Deceleration ramp adaptation**		YES
		Activating this function automatically adapts the deceleration ramp, if this has been set at too low a value for the inertia of the load. nO: Function inactive YES: Function active. The function is incompatible with applications requiring: • Positioning on a ramp • The use of a braking resistor (no guarantee of the function operating correctly) brA is forced to nO if brake control (bLC) is assigned (page 54).		

LI or bit	Frequency	Ramp
0	<Frt	ACC, dEC
0	>Frt	AC2, dE2
1	<Frt	AC2, dE2
1	>Frt	AC2, dE2

(1) Parameter can also be accessed in the SEt- menu.

These parameters only appear if the function has been enabled.

Application functions menu FUn-

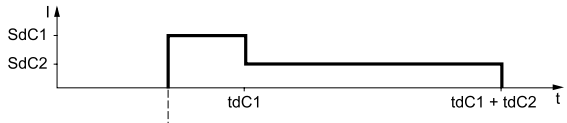
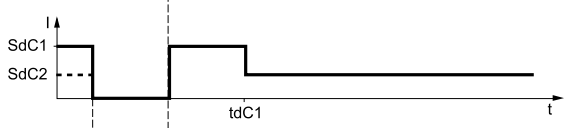
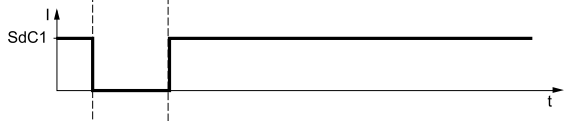
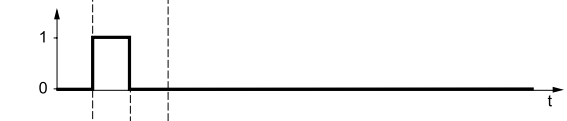
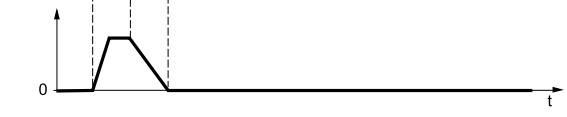
Code		Description	Adjustment range	Factory setting
StC-		**Stop modes**		
	Stt	**Normal stop mode**		Stn
		Stop mode on disappearance of the run command or appearance of a stop command. rMP: On ramp FSt: Fast stop nSt: Freewheel stop dCI: DC injection stop		
	FSt	**Fast stop via logic input**		nO
		nO: Not assigned LI1: Logic input LI1 LI2: Logic input LI2 LI3: Logic input LI3 LI4: Logic input LI4 LI5: Logic input LI5 LI6: Logic input LI6 If LAC = L3, the following assignments are possible: Cd11: Bit 11 of the Modbus or CANopen control word Cd12: Bit 12 of the Modbus or CANopen control word Cd13: Bit 13 of the Modbus or CANopen control word Cd14: Bit 14 of the Modbus or CANopen control word Cd15: Bit 15 of the Modbus or CANopen control word The stop is activated when the logic state of the input changes to 0 and the control word bit changes to 1. The fast stop is a stop on a reduced ramp via parameter dCF. If the input falls back to state 1 and the run command is still active, the motor will only restart if 2-wire level control has been configured (tCC = 2C and tCt = LEL or PFO, see page 23). In other cases, a new run command must be sent.		
	dCF	**Coefficient for dividing the deceleration ramp time for fast stopping.**	0 to 10	4
		Ensure that the reduced ramp is not too low in relation to the load to be stopped. The value 0 corresponds to the minimum ramp.		
	dCI	**DC injection via logic input**		nO
		nO: Not assigned LI1: Logic input LI1 LI2: Logic input LI2 LI3: Logic input LI3 LI4: Logic input LI4 LI5: Logic input LI5 LI6: Logic input LI6 If LAC = L3, the following assignments are possible: Cd11: Bit 11 of the Modbus or CANopen control word Cd12: Bit 12 of the Modbus or CANopen control word Cd13: Bit 13 of the Modbus or CANopen control word Cd14: Bit 14 of the Modbus or CANopen control word Cd15: Bit 15 of the Modbus or CANopen control word Braking is activated when the logic state of the input or control word bit is at 1.		
	IdC	**Level of DC injection braking current activated via logic input or selected as stop mode** (1)(3)	0 to In (2)	0.7 In (2)
		After 5 seconds the injection current is peak limited at 0.5 Ith if it is set at a higher value.		
	tdC	**Total DC injection braking time selected as normal stop mode** (1)(3)	0.1 to 30 s	0.5 s

(1) Parameter can also be accessed in the settings menu (SEt-).
(2) In corresponds to the nominal drive current indicated in the Installation Manual and on the drive rating plate.
(3) Caution: These settings are not related to the "automatic standstill DC injection" function.

These parameters only appear if the function has been enabled.

Code		Description	Adjustment range	Factory setting
StC- (continued)	nSt	**Freewheel stop via logic input**		nO
		nO: Not assigned LI1: Logic input LI1 LI2: Logic input LI2 LI3: Logic input LI3 LI4: Logic input LI4 LI5: Logic input LI5 LI6: Logic input LI6 The stop is activated when the input is in logic state 0. If the input falls back to state 1 and the run command is still active, the motor will only restart if 2-wire level control has been configured. In other cases, a new run command must be sent.		

Code		Description	Adjustment range	Factory setting
AdC-		**Standstill DC injection**		
	AdC	**Automatic standstill DC injection (at the end of the ramp)**		YES
		nO: No injection YES: Standstill injection for adjustable period Ct: Continuous standstill injection ⚠ This parameter gives rise to the injection of current even if a run command has not been sent. It can be accessed with the drive running.		
	tdC1	**Automatic standstill DC injection time** (1)	0.1 to 30 s	0.5 s
	SdC1	**Level of automatic standstill DC injection current** (1)	0 to 1.2 In (2)	0.7 In (2)
		⚠ Check that the motor will withstand this current without overheating.		
	tdC2	**2nd automatic standstill DC injection time** (1)	0 to 30 s	0 s
	SdC2	**2nd level of standstill DC injection current** (1)	0 to 1.2 In (2)	0.5 In (2)
		⚠ Check that the motor will withstand this current without overheating.		

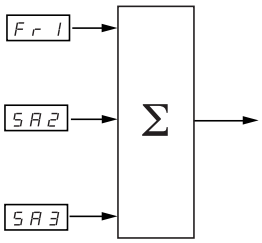
AdC	SdC2	Operation
YES	x	
Ct	≠ 0	
Ct	= 0	
Run command		
Speed		

(1) Parameter can also be accessed in the settings menu (SEt-).
(2) In corresponds to the nominal drive current indicated in the Installation Manual and on the drive rating plate.

These parameters only appear if the function has been enabled.

Code		Description	Adjustment range	Factory setting
SA1-		**Summing inputs** Can be used to sum one or two inputs to reference Fr1 only.		
	SA2	**Summing input 2**		AI2
		nO: Not assigned AI1: Analog input AI1 AI2: Analog input AI2 AI3: Analog input AI3 AIP: Potentiometer (type A drives only) If LAC = L3, the following assignments are possible: Mdb: Reference via Modbus CAn: Reference via CANopen LCC: Reference via the remote terminal, LFr parameter in the SEt- menu page 16.		
	SA3	**Summing input 3**		nO
		nO: Not assigned AI1: Analog input AI1 AI2: Analog input AI2 AI3: Analog input AI3 AIP: Potentiometer (type A drives only) If LAC = L3, the following assignments are possible: Mdb: Reference via Modbus CAn: Reference via CANopen LCC: Reference via the remote terminal, LFr parameter in the SEt- menu page 16.		

Summing inputs



Note:
AI2 is an input ± 10 V, which can allow a subtraction by summing a negative signal.

See the complete diagrams on pages 28 and 30.

Preset speeds

2, 4, 8 or 16 speeds can be preset, requiring 1, 2, 3 or 4 logic inputs respectively.

The following order of assignments must be observed: PS2, then PS4 then PS8, then PS16.

Combination table for preset speed inputs

16 speeds LI (PS16)	8 speeds LI (PS8)	4 speeds LI (PS4)	2 speeds LI (PS2)	Speed reference
0	0	0	0	Reference (1)
0	0	0	1	SP2
0	0	1	0	SP3
0	0	1	1	SP4
0	1	0	0	SP5
0	1	0	1	SP6
0	1	1	0	SP7
0	1	1	1	SP8
1	0	0	0	SP9
1	0	0	1	SP10
1	0	1	0	SP11
1	0	1	1	SP12
1	1	0	0	SP13
1	1	0	1	SP14
1	1	1	0	SP15
1	1	1	1	SP16

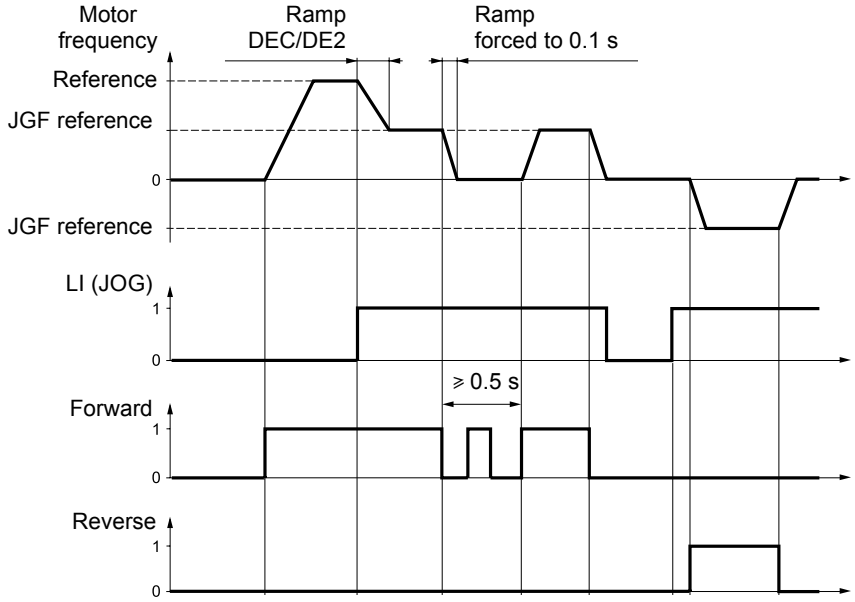
(1) See the diagrams on page 28 and page 30: Reference 1 = (SP1).

Code		Description	Adjustment range	Factory setting
PSS-		**Preset speeds**		
	PS2	**2 preset speeds**		If tCC = 2C: LI3 If tCC = 3C: nO If tCC = LOC: LI3
		Selecting the assigned logic input activates the function. nO: Not assigned LI1: Logic input LI1 LI2: Logic input LI2 LI3: Logic input LI3 LI4: Logic input LI4 LI5: Logic input LI5 LI6: Logic input LI6 If LAC = L3, the following assignments are possible: Cd11: Bit 11 of the Modbus or CANopen control word Cd12: Bit 12 of the Modbus or CANopen control word Cd13: Bit 13 of the Modbus or CANopen control word Cd14: Bit 14 of the Modbus or CANopen control word Cd15: Bit 15 of the Modbus or CANopen control word		
	PS4	**4 preset speeds**		If tCC = 2C: LI4 If tCC = 3C: nO If tCC = LOC: LI4
		Selecting the assigned logic input activates the function. Check that PS2 has been assigned before assigning PS4. nO: Not assigned LI1: Logic input LI1 LI2: Logic input LI2 LI3: Logic input LI3 LI4: Logic input LI4 LI5: Logic input LI5 LI6: Logic input LI6 If LAC = L3, the following assignments are possible: Cd11: Bit 11 of the Modbus or CANopen control word Cd12: Bit 12 of the Modbus or CANopen control word Cd13: Bit 13 of the Modbus or CANopen control word Cd14: Bit 14 of the Modbus or CANopen control word Cd15: Bit 15 of the Modbus or CANopen control word		
	PS8	**8 preset speeds**		nO
		Selecting the assigned logic input activates the function. Check that PS4 has been assigned before assigning PS8. nO: Not assigned LI1: Logic input LI1 LI2: Logic input LI2 LI3: Logic input LI3 LI4: Logic input LI4 LI5: Logic input LI5 LI6: Logic input LI6 If LAC = L3, the following assignments are possible: Cd11: Bit 11 of the Modbus or CANopen control word Cd12: Bit 12 of the Modbus or CANopen control word Cd13: Bit 13 of the Modbus or CANopen control word Cd14: Bit 14 of the Modbus or CANopen control word Cd15: Bit 15 of the Modbus or CANopen control word		

Code		Description	Adjustment range	Factory setting
	PS16	**16 preset speeds**		nO
		Selecting the assigned logic input activates the function. Check that PS8 has been assigned before assigning PS16. nO: Not assigned LI1: Logic input LI1 LI2: Logic input LI2 LI3: Logic input LI3 LI4: Logic input LI4 LI5: Logic input LI5 LI6: Logic input LI6 If LAC = L3, the following assignments are possible: Cd11: Bit 11 of the Modbus or CANopen control word Cd12: Bit 12 of the Modbus or CANopen control word Cd13: Bit 13 of the Modbus or CANopen control word Cd14: Bit 14 of the Modbus or CANopen control word Cd15: Bit 15 of the Modbus or CANopen control word		
	SP2	**2nd preset speed** (1)	0.0 to 500.0 Hz	10 Hz
	SP3	**3rd preset speed** (1)	0.0 to 500.0 Hz	15 Hz
	SP4	**4th preset speed** (1)	0.0 to 500.0 Hz	20 Hz
	SP5	**5th preset speed** (1)	0.0 to 500.0 Hz	25 Hz
	SP6	**6th preset speed** (1)	0.0 to 500.0 Hz	30 Hz
	SP7	**7th preset speed** (1)	0.0 to 500.0 Hz	35 Hz
	SP8	**8th preset speed** (1)	0.0 to 500.0 Hz	40 Hz
	SP9	**9th preset speed** (1)	0.0 to 500.0 Hz	45 Hz
	SP10	**10th preset speed** (1)	0.0 to 500.0 Hz	50 Hz
	SP11	**11th preset speed** (1)	0.0 to 500.0 Hz	55 Hz
	SP12	**12th preset speed** (1)	0.0 to 500.0 Hz	60 Hz
	SP13	**13th preset speed** (1)	0.0 to 500.0 Hz	70 Hz
	SP14	**14th preset speed** (1)	0.0 to 500.0 Hz	80 Hz
	SP15	**15th preset speed** (1)	0.0 to 500.0 Hz	90 Hz
	SP16	**16th preset speed** (1)	0.0 to 500.0 Hz	100 Hz

(1) Parameter can also be accessed in the settings menu (SEt-).

These parameters only appear if the function has been enabled.

Code		Description	Adjustment range	Factory setting
JOG-		**Jog operation**		
	JOG	**Jog operation**		If tCC = 2C: nO If tCC = 3C: LI4 If tCC = LOC: nO
		Selecting the assigned logic input activates the function. nO: Not assigned LI1: Logic input LI1 LI2: Logic input LI2 LI3: Logic input LI3 LI4: Logic input LI4 LI5: Logic input LI5 LI6: Logic input LI6 Example: 2-wire control operation (tCC = 2C)  		
	JGF	**Jog operation reference** (1)	0 to 10 Hz	10 Hz

(1) Parameter can also be accessed in the settings menu (SEt-).

These parameters only appear if the function has been enabled.

+/- speed

The function can only be accessed if LAC = L2 or L3 (see page 33).
Two types of operation are available.

1 Use of single action buttons: Two logic inputs are required in addition to the operating direction(s).
The input assigned to the "+ speed" command increases the speed, the input assigned to the "- speed" command decreases the speed.

2 Use of double action buttons: Only one logic input assigned to "+ speed" is required.

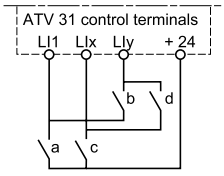
+ speed/- speed with double action buttons:

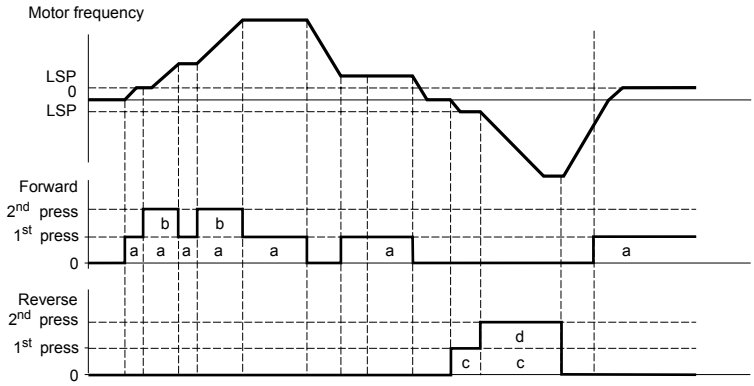
Description: 1 button pressed twice for each direction of rotation. Each action closes a contact.

	Released (- speed)	1st press (speed maintained)	2nd press (+ speed)
Forward button	–	a	a and b
Reverse button	–	c	c and d

Example of wiring:

LI1: forward
LIx: reverse
LIy: + speed





This type of +/- speed is incompatible with 3-wire control.

Whichever type of operation is selected, the max. speed is set by HSP (see page 16).

Note:
If the reference is switched via rFC (see page 34) from any reference channel to another with "+/- speed" the value of reference rFr (after ramp) is copied at the same time. This prevents the speed being incorrectly reset to zero when switching takes place.

Application functions menu FUn-

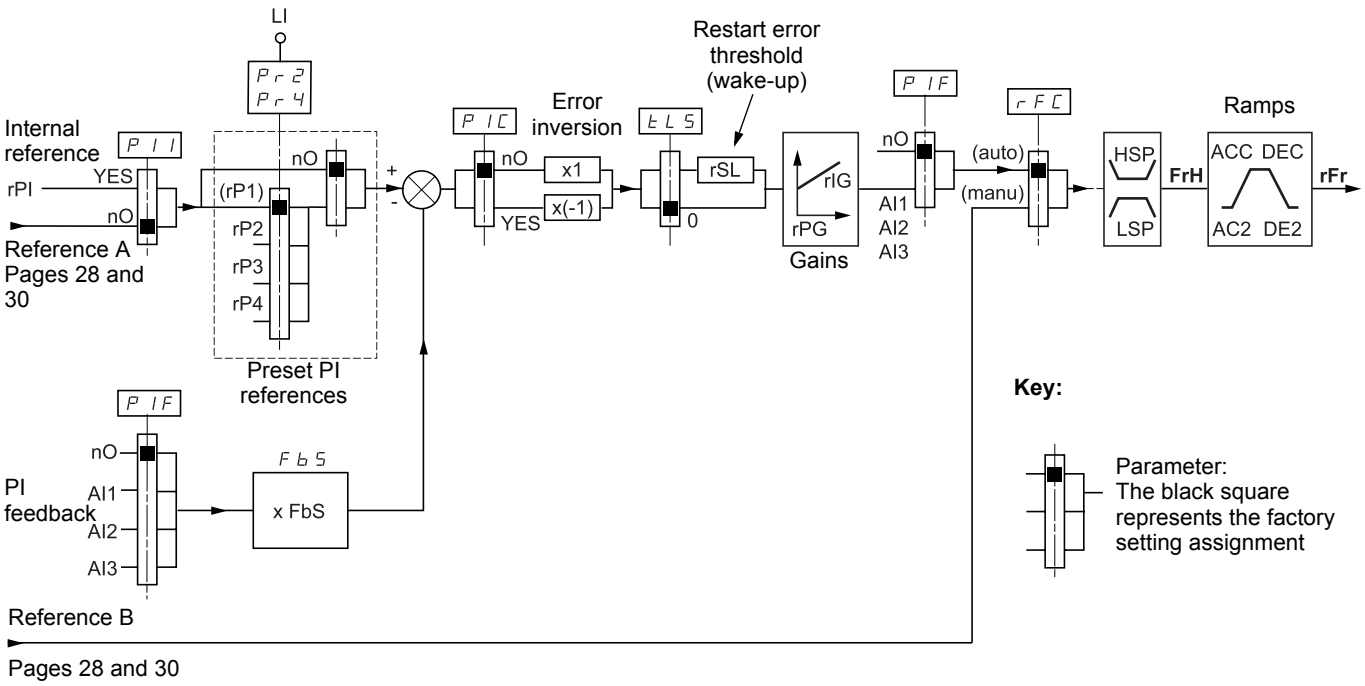
Code		Description	Adjustment range	Factory setting
UPd -		**+/- speed (motorized potentiometer)** The function can only be accessed if LAC = L2 or L3 and UPdH or UPdt has been selected (see page 33).		
	USP	**+ speed** Can only be accessed for UPdt.		nO
		Selecting the assigned logic input activates the function. nO: Not assigned LI1: Logic input LI1 LI2: Logic input LI2 LI3: Logic input LI3 LI4: Logic input LI4 LI5: Logic input LI5 LI6: Logic input LI6		
	dSP	**- speed** Can only be accessed for UPdt.		nO
		Selecting the assigned logic input activates the function. nO: Not assigned LI1: Logic input LI1 LI2: Logic input LI2 LI3: Logic input LI3 LI4: Logic input LI4 LI5: Logic input LI5 LI6: Logic input LI6		
	Str	**Save reference**		nO
		Associated with the "+/- speed" function, this parameter can be used to save the reference: • When the run commands disappear (saved to RAM) • When the mains supply or the run commands disappear (saved to EEPROM) On the next start-up, the speed reference is the last reference saved. nO: No save rAM: Save to RAM EEP: Save to EEPROM		

These parameters only appear if the function has been enabled.

PI regulator

Diagram

The function is activated by assigning an analog input to the PI feedback (measurement).



PI feedback:
The PI feedback must be assigned to one of the analog inputs (AI1, AI2 or AI3).

PI reference:
The PI reference can be assigned to the following parameters in order of priority:
- Preset references via logic inputs (rP2, rP3, rP4)
- Internal reference (rPI)
- Reference Fr1 (see page 33)

Combination table for preset PI references

LI (Pr4)	LI (Pr2)	Pr2 = nO	Reference
			rPI or Fr1
0	0		rPI or Fr1
0	1		rP2
1	0		rP3
1	1		rP4

Parameters which can be accessed in the settings menu (SEt-):
- Internal reference (rPI)
- Preset references (rP2, rP3, rP4)
- Regulator proportional gain (rPG)
- Regulator integral gain (rIG)
- FbS parameter:
  The FbS parameter can be used to scale the reference on the basis of the variation range of the PI feedback (sensor rating).
  E.g.: Pressure control
  PI reference (process) 0 - 5 bar (0 - 100%)
  Rating of pressure sensor 0 - 10 bar
  FbS = Max. sensor scale/Max. process
  FbS = 10/5= 2
- rSL parameter:
  Can be used to set the PI error threshold above which the PI regulator will be reactivated (wake-up) after a stop due to the max. time threshold being exceeded at low speed (tLS).
- Reversal of the direction of correction (PIC): If PIC = nO, the speed of the motor will increase when the error is positive, for example: pressure control with a compressor. If PIC = YES, the speed of the motor will decrease when the error is positive, for example: temperature control via a cooling fan.

"Manual - Automatic" operation with PI

This function combines the PI regulator and the switching of reference rFC (page 34). The speed reference is given by Fr2 or by the PI function, depending on the state of the logic input.

Setting up the PI regulator

1 Configuration in PI mode
See the diagram on page 49.

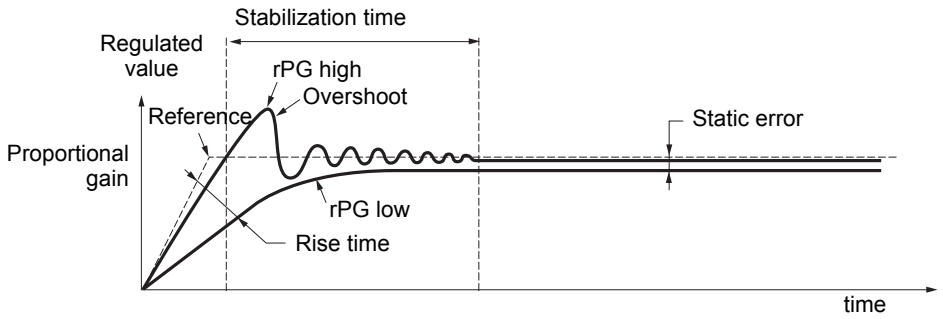
2 Perform a test in factory settings mode (in most cases, this will be sufficient).
To optimize the drive, adjust rPG or rIG gradually and independently and observe the effect on the PI feedback in relation to the reference.

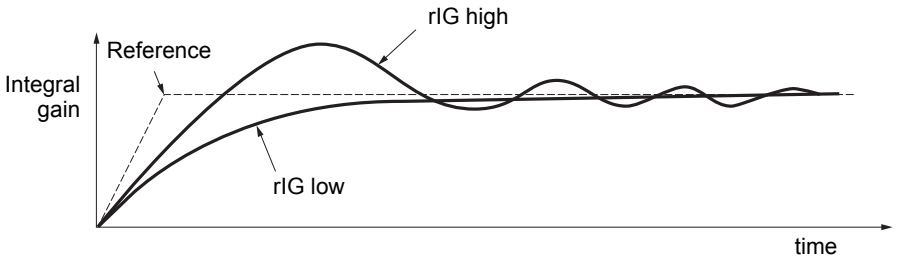
3 If the factory settings are unstable or the reference is incorrect:

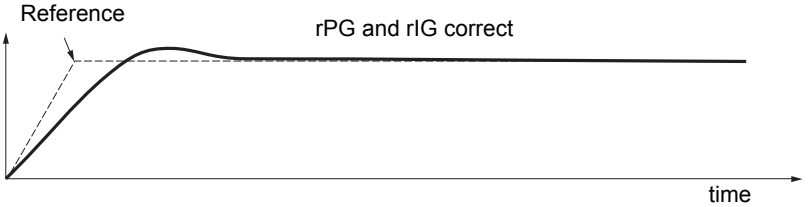
Perform a test with a speed reference in Manual mode (without PI regulator) and with the drive on load for the speed range of the system:
- In steady state, the speed must be stable and comply with the reference and the PI feedback signal must be stable.
- In transient state, the speed must follow the ramp and stabilize quickly and the PI feedback must follow the speed.

If this is not the case, see the settings for the drive and/or sensor signal and cabling.

Switch to PI mode.
Set brA to no (no auto-adaptation of the ramp).
Set the speed ramps (ACC, dEC) to the minimum permitted by the mechanics without triggering an ObF fault.
Set the integral gain (rIG) to minimum.
Observe the PI feedback and the reference.
Do several RUN/STOP or vary the load or reference rapidly.
Set the proportional gain (rPG) in order to ascertain the ideal compromise between response time and stability in transient phases (slight overshoot and 1 to 2 oscillations before stabilizing).
If the reference varies from the preset value in steady state, gradually increase the integral gain (rIG), reduce the proportional gain (rPG) in the event of instability (pump applications), find a compromise between response time and static precision (see diagram).
Perform in-production tests throughout the reference range.







The oscillation frequency depends on the system kinematics.

Parameter	Rise time	Overshoot	Stabilization time	Static error
rPG ↗	↘↘	↗	=	↘
rIG ↗	↘	↗↗	↗	↘↘

Application functions menu FUn-

Code		Description	Adjustment range	Factory setting
PI-		**PI regulator**		
	PIF	**PI regulator feedback**		nO
		nO: Not assigned AI1: Analog input AI1 AI2: Analog input AI2 AI3: Analog input AI3		
	rPG	**PI regulator proportional gain** (1)	0.01 to 100	1
		Contributes to dynamic performance during rapid changes in the PI feedback.		
	rIG	**PI regulator integral gain** (1)	0.01 to 100	1
		Contributes to static precision during slow changes in the PI feedback.		
	FbS	**PI feedback multiplication coefficient** (1)	0.1 to 100	1
		For process adaptation		
	PIC	Reversal of the direction of correction of the PI regulator (1)		nO
		nO: normal YES: reverse		
	Pr2	**2 preset PI references**		nO
		Selecting the assigned logic input activates the function. nO: Not assigned LI1: Logic input LI1 LI2: Logic input LI2 LI3: Logic input LI3 LI4: Logic input LI4 LI5: Logic input LI5 LI6: Logic input LI6 If LAC = L3, the following assignments are possible: Cd11: Bit 11 of the Modbus or CANopen control word Cd12: Bit 12 of the Modbus or CANopen control word Cd13: Bit 13 of the Modbus or CANopen control word Cd14: Bit 14 of the Modbus or CANopen control word Cd15: Bit 15 of the Modbus or CANopen control word		
	Pr4	**4 preset PI references**		nO
		Selecting the assigned logic input activates the function. Check that Pr2 has been assigned before assigning Pr4. nO: Not assigned LI1: Logic input LI1 LI2: Logic input LI2 LI3: Logic input LI3 LI4: Logic input LI4 LI5: Logic input LI5 LI6: Logic input LI6 If LAC = L3, the following assignments are possible: Cd11: Bit 11 of the Modbus or CANopen control word Cd12: Bit 12 of the Modbus or CANopen control word Cd13: Bit 13 of the Modbus or CANopen control word Cd14: Bit 14 of the Modbus or CANopen control word Cd15: Bit 15 of the Modbus or CANopen control word		
	rP2	**2nd preset PI reference** (1)	0 to 100%	30%
		Only appears if Pr2 has been enabled by selecting an input.		
	rP3	**3rd preset PI reference** (1)	0 to 100%	60%
		Only appears if Pr4 has been enabled by selecting an input.		
	rP4	**4th preset PI reference** (1)	0 to 100%	90%
		Only appears if Pr4 has been enabled by selecting an input.		

(1) Parameter can also be accessed in the settings menu (SEt-).

These parameters only appear if the function has been enabled.

Application functions menu FUn-

Code		Description	Adjustment range	Factory setting
PI- (continued)	rSL	**Restart error threshold ("wake-up" threshold)**	0 to 100%	0
		If the "PI" and "Low speed operating time"(tLS) (see page 18) functions are configured at the same time, the PI regulator may attempt to set a speed lower than LSP. This results in unsatisfactory operation which consists of starting, operating at low speed then stopping, and so on... Parameter rSL (restart error threshold) can be used to set a minimum PI error threshold for restarting after a stop at prolonged LSP. The function is inactive if tLS = 0.		
	PII	**Internal PI regulator reference**		nO
		nO: The PI regulator reference is Fr1, except for UPdH and UPdt (+/- speed cannot be used as the PI regulator reference). YES: The PI regulator reference is internal via parameter rPI.		
	rPI	**Internal PI regulator reference** (1)	0 to 100%	0

(1) Parameter can also be accessed in the settings menu (SEt-).

These parameters only appear if the function has been enabled.

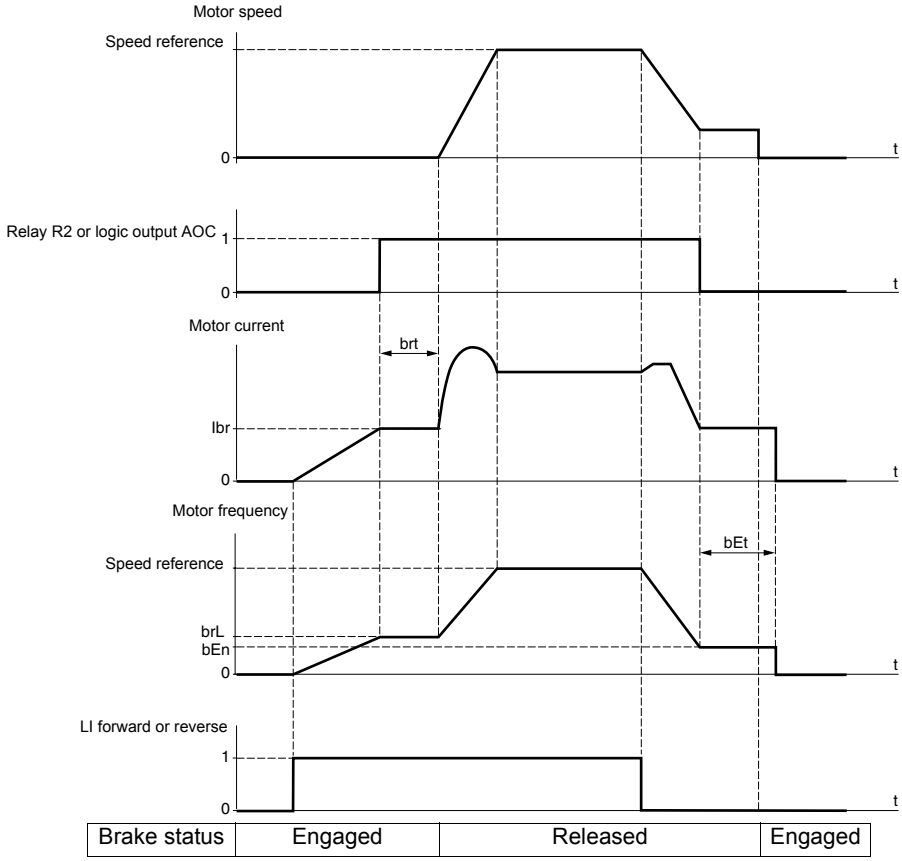
Brake control

The function can only be accessed if LAC = L2 or L3 (page 28).
This function, which can be assigned to relay R2 or to logic output AOC, enables the drive to manage an electromagnetic brake.

Principle:

Synchronize brake release with the build-up of torque during start-up and brake engage at zero speed on stopping, to prevent jolting.

Brake sequence



Settings which can be accessed in the FUn- menu:
- Brake release frequency (brL)
- Brake release current (Ibr)
- Brake release time (brt)
- Brake engage frequency (bEn)
- Brake engage time (bEt)
- Brake release pulse (bIP)

Recommended settings for brake control:
1 Brake release frequency:
- Horizontal movement: Set to 0.
- Vertical movement: Set to a frequency equal to the nominal slip of the motor in Hz.

2 Brake release current (Ibr):
- Horizontal movement: Set to 0.
- Vertical movement: Preset the nominal current of the motor then adjust it in order to prevent jolting on start-up, making sure that the maximum load is held when the brake is released.

3 Brake release time (brt):
Adjust according to the type of brake. It is the time required for the mechanical brake to release.

4 Brake engage frequency (bEn)
- Horizontal movement: Set to 0.
- Vertical movement: Set to a frequency equal to the nominal slip of the motor in Hz. **Caution: bEn maxi = LSP, you must therefore first set LSP to a sufficient value**.

5 Brake engage time (bEt):
Adjust according to the type of brake. It is the time required for the mechanical brake to engage.

6 Brake release pulse:
- Horizontal movement: Set to nO.
- Vertical movement: Set to YES and check that the motor torque direction for "Forward" control corresponds to the upward direction of the load. If necessary, reverse two motor phases. This parameter generates motor torque in an upward direction regardless of the direction of operation commanded in order to maintain the load whilst the brake is releasing.

Application functions menu FUn-

Code		Description	Adjustment range	Factory setting
bLC-		**Brake control** The function can only be accessed if LAC = L2 or L3 (page 28).		
	bLC	**Brake control configuration**		nO
		nO: Not assigned r2: Relay R2 dO: Logic output AOC If bLC is assigned, parameter FLr (page 61) and brA (page 38) are forced to nO, and parameter OPL (page 61) is forced to YES.		
	brL	**Brake release frequency**	0.0 to 10.0 Hz	According to drive rating
	Ibr	**Motor current threshold for brake release**	0 to 1.36 In (1)	According to drive rating
	brt	**Brake release time**	0 to 5 s	0.5 s
	LSP	**Low speed**	0 to HSP (page 16)	0 Hz
		Motor frequency at min. reference. This parameter can also be modified in the SEt- menu (page 16).		
	bEn	**Brake engage frequency threshold**	nO - 0 to LSP	nO
		nO: Not adjusted 0 to LSP: Adjustment range (Hz) If bLC is assigned and bEn remains equal to nO, the drive will lock on a bLF fault at the first run command.		
	bEt	**Brake engage time**	0 to 5 s	0.5s
	bIP	**Brake release pulse**		nO
		nO: Whilst the brake is releasing, the motor torque direction corresponds to the direction of rotation commanded. YES: Whilst the brake is releasing, the motor torque direction is always forward, regardless of the direction of operation commanded. ⚠ Check that the motor torque direction for "Forward" control corresponds to the upward direction of the load. If necessary, reverse two motor phases.		

(1) In corresponds to the nominal drive current indicated in the Installation Manual and on the drive rating plate.

These parameters only appear if the function has been enabled.

Code		Description	Adjustment range	Factory setting
LC2-		**Switching for second current limit** The function can only be accessed if LAC = L2 or L3 (page 28).		
	LC2	**Switching for second current limit**		nO
		Selecting the assigned logic input activates the function. nO: Not assigned LI1: Logic input LI1 LI2: Logic input LI2 LI3: Logic input LI3 LI4: Logic input LI4 LI5: Logic input LI5 LI6: Logic input LI6 If LAC = L3, the following assignments are possible: Cd11: Bit 11 of the Modbus or CANopen control word Cd12: Bit 12 of the Modbus or CANopen control word Cd13: Bit 13 of the Modbus or CANopen control word Cd14: Bit 14 of the Modbus or CANopen control word Cd15: Bit 15 of the Modbus or CANopen control word CL1 is enabled when the logic input or control word bit is in state 0 (SEt- menu page 18). CL2 is enabled when the logic input or control word bit is in state 1.		
	CL2	**2nd current limit** (1)	0.25 to 1.5 In (2)	1.5 In (2)

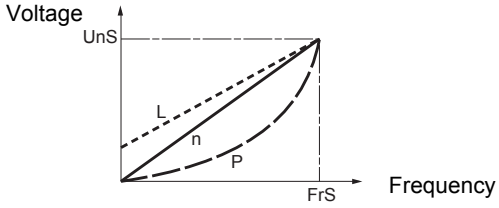
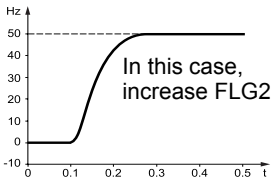
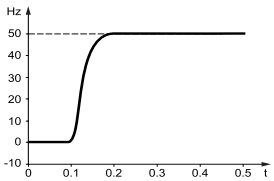
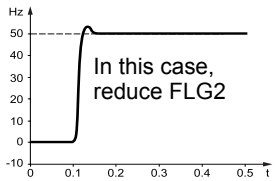
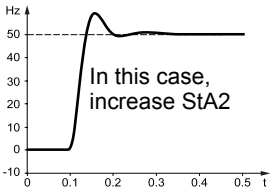
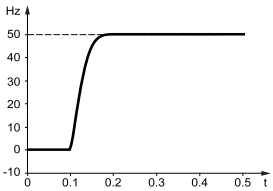
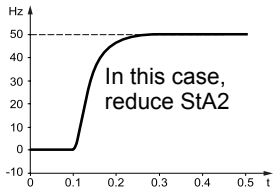
(1) Parameter can also be accessed in the settings menu (SEt-).
(2) In corresponds to the nominal drive current indicated in the Installation Manual and on the drive rating plate.

These parameters only appear if the function has been enabled.

Code		Description	Adjustment range	Factory setting
CHP-		**Motor switching** The function can only be accessed if LAC = L2 or L3 (page 28).		
	CHP	**Switching, motor 2**		nO
		nO: Not assigned LI1: Logic input LI1 LI2: Logic input LI2 LI3: Logic input LI3 LI4: Logic input LI4 LI5: Logic input LI5 LI6: Logic input LI6 If LAC = L3, the following assignments are possible: Cd11: Bit 11 of the Modbus or CANopen control word Cd12: Bit 12 of the Modbus or CANopen control word Cd13: Bit 13 of the Modbus or CANopen control word Cd14: Bit 14 of the Modbus or CANopen control word Cd15: Bit 15 of the Modbus or CANopen control word LI or bit = 0: Motor 1 LI or bit = 1: Motor 2 ⚠ - The motor switching function disables motor thermal protection. An external means of motor thermal protection must therefore be provided. - If you use this function, do not use the tUn auto-tuning function (page 21) on motor 2 and do not configure tUn = rUn or POn. - Changes to parameters are only taken into account when the drive is locked.		
	UnS2	**Nominal motor voltage (motor 2) given on the rating plate**	According to drive rating	According to drive rating
		ATV31●●●M2: 100 to 240 V ATV31●●●M3X: 100 to 240 V ATV31●●●N4: 100 to 500 V ATV31●●●S6X: 100 to 600 V		
	FrS2	**Nominal motor frequency (motor 2) given on the rating plate**	10 to 500 Hz	50 Hz
		⚠ The ratio $\frac{\text{UnS (in volts)}}{\text{FrS (in Hz)}}$ must not exceed the following values ATV31●●●M2: 7 max. ATV31●●●M3X: 7 max. ATV31●●●N4: 14 max. ATV31●●●S6X: 17 max. The factory setting is 50 Hz, or 60 Hz if bFr is set to 60 Hz.		
	nCr2	**Nominal motor current (motor 2) given on the rating plate**	0.25 to 1.5 In (2)	According to drive rating
	nSP2	**Nominal motor speed (motor 2) given on the rating plate**	0 to 32760 RPM	According to drive rating
		0 to 9999 RPM then 10.00 to 32.76 KRPM If, rather than the nominal speed, the rating plate indicates the synchronous speed and the slip in Hz or as a %, calculate the nominal speed as follows: • Nominal speed = Synchronous speed x $\frac{100 - \text{slip as a \%}}{100}$ or • Nominal speed = Synchronous speed x $\frac{50 - \text{slip in Hz}}{50}$ (50 Hz motors) or • Nominal speed = Synchronous speed x $\frac{60 - \text{slip in Hz}}{60}$ (60 Hz motors)		

(1) Parameter can also be accessed in the settings menu (SEt-).
(2) In corresponds to the nominal drive current indicated in the Installation Manual and on the drive rating plate.

These parameters only appear if the function has been enabled.

Code		Description	Adjustment range	Factory setting
CHP- (continued)	COS2	**Motor Cos Phi (motor 2) given on the rating plate**	0.5 to 1	According to drive rating
	UFt2	**Selection of the type of voltage/frequency ratio motor 2**		n
		L : Constant torque for motors connected in parallel or special motors P: Variable torque: Pump and fan applications n: Sensorless flux vector control for constant torque applications nLd: Energy saving, for variable torque applications not requiring high dynamics (behaves in a similar way to the P ratio at no load and the n ratio on load). 		
	UFr2	**IR compensation/Voltage boost, motor 2** (1)	0 to 100%	20
		For UFt2 = n or nLd: IR compensation. For UFt2 = L or P: Voltage boost. Used to optimize the torque at very low speed (increase UFr2 if the torque is insufficient). Check that the value of UFr2 is not too high for when the motor is warm (risk of instability). Modifying UFt2 will cause UFr2 to return to the factory setting (20%).		
	FLG2	**Frequency loop gain, motor 2** (1)	1 to 100%	20
		Parameter can only be accessed if UFt2 = n or nLd. The FLG2 parameter adjusts the drive's ability to follow the speed ramp based on the inertia of the machine being driven. Too high a gain may result in operating instability. FLG2 low  FLG2 correct  FLG2 high 		
	StA2	**Frequency loop stability, motor 2** (1)	1 to 100%	20
		Parameter can only be accessed if UFt2 = n or nLd. Used to adapt the return to steady state after a speed transient (acceleration or deceleration), according to the dynamics of the machine. Gradually increase the stability to avoid any overspeed. StA2 low  StA2 correct  StA2 high 		
	SLP2	**Slip compensation, motor 2** (1)	0 to 150%	100
		Parameter can only be accessed if UFt2 = n or nLd. Used to adjust the slip compensation value fixed by nominal motor speed. The speeds given on motor rating plates are not necessarily exact. • If slip setting < actual slip: the motor is not rotating at the correct speed in steady state. • If slip setting > actual slip: the motor is overcompensated and the speed is unstable.		

(1) Parameter can also be accessed in the settings menu (SEt-).

These parameters only appear if the function has been enabled.

Management of limit switch

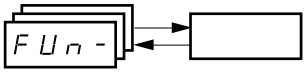
The function can only be accessed if LAC = L2 or L3 (page 28).
It can be used to manage the operation of one or two limit switches (1 or 2 directions of operation):

- Assignment of one or two logic inputs (forward limit, reverse limit)
- Selection of the type of stop (on ramp, fast or freewheel)
  Following a stop, the motor is permitted to restart in the opposite direction only.
- The stop is performed when the input is in state 0. The direction of operation is authorized in state 1.

Code		Description	Adjustment range	Factory setting
LSt-		**Management of limit switches** The function can only be accessed if LAC = L2 or L3 (page 28).		
	LAF	**Limit, forward direction**		nO
		nO: Not assigned LI1: Logic input LI1 LI2: Logic input LI2 LI3: Logic input LI3 LI4: Logic input LI4 LI5: Logic input LI5 LI6: Logic input LI6		
	LAr	**Limit, reverse direction**		nO
		nO: Not assigned LI1: Logic input LI1 LI2: Logic input LI2 LI3: Logic input LI3 LI4: Logic input LI4 LI5: Logic input LI5 LI6: Logic input LI6		
	LAS	**Type of limit switch stop**		nSt
		rMP: On ramp FSt: Fast stop nSt: Freewheel stop		

These parameters only appear if the function has been enabled via the selection of a logic input.

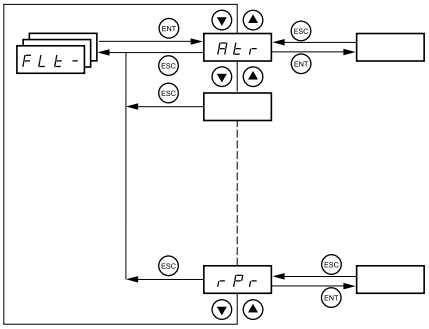
Application functions menu FUn-



SCS	**Saving the configuration (1)**		nO
	nO: Function inactive Str I: Saves the current configuration (but not the result of auto-tuning) to EEPROM. SCS automatically switches to nO as soon as the save has been performed. This function is used to keep another configuration in reserve, in addition to the current configuration. When drives leave the factory the current configuration and the backup configuration are both initialized with the factory configuration. • If the remote terminal option is connected to the drive, the following additional selection options will appear: FIL I, FIL2, FIL3, FIL4 (files available in the remote terminal's EEPROM memory for saving the current configuration). They can be used to store between 1 and 4 different configurations which can also be stored on or even transferred to other drives of the same rating. SCS automatically switches to nO as soon as the save has been performed.		
FCS	**Return to factory setting/restore configuration (1)**		nO
	nO: Function inactive rECI: The current configuration becomes identical to the backup configuration previously saved by SCS = StrI. rECI is only visible if the backup has been carried out. FCS automatically changes to nO as soon as this action has been performed. InI: The current configuration becomes identical to the **factory setting**. FCS automatically changes to nO as soon as this action has been performed. • If the remote terminal option is connected to the drive, the following additional selection options appear, as long as the corresponding files have been loaded in the remote terminal's EEPROM memory (0 to 4 files): FIL I, FIL2, FIL3, FIL4. They enable the current configuration to be replaced with one of the 4 configurations that may be loaded on the remote terminal. FCS automatically changes to nO as soon as this action has been performed. **Caution:** If nAd appears on the display briefly once FCS has switched to nO, this means that the configuration transfer is not possible and has not been performed (different drive ratings for example). If nEr appears on the display briefly once the parameter has switched to nO, this means that a configuration transfer error has occurred and the factory settings must be restored using InI. In both cases, check the configuration to be transferred before trying again. ⚠ For rECI, InI and FL1 to FL4 to be taken into account, the ENT key must be held down for 2 s.		

(1) SCS and FCS can be accessed via several configuration menus but they concern all menus and parameters as a whole.

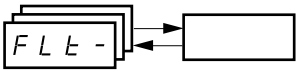
Fault menu FLt-



Automatic restart

Operating time reset to zero

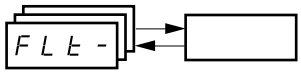
The parameters can only be modified when the drive is stopped and no run command is present.
On the optional remote terminal, this menu can be accessed with the switch in the position.



Code	Description	Factory setting
Atr	**Automatic restart**	nO
	nO: Function inactive YES: Automatic restart, after locking on a fault, if the fault has disappeared and the other operating conditions permit the restart. The restart is performed by a series of automatic attempts separated by increasingly longer waiting periods: 1 s, 5 s, 10 s, then 1 min for the following periods. If the restart has not taken place once the configurable time tAr has elapsed, the procedure is aborted and the drive remains locked until it is powered down then powered up. The following faults permit this function: External fault (EPF) Loss of 4-20 mA reference (LFF) CANopen fault (COF) System overvoltage (OSF) Loss of a line phase (PHF) Loss of a motor phase (OPF) DC bus overvoltage (ObF) Motor overload (OLF) Serial link (SLF) Drive overheating (OHF) The drive safety relay remains activated if this function is active. The speed reference and the operating direction must be maintained. Use 2-wire control (tCC = 2C) with tCt = LEL or PFO (page 23). ⚠ **Check that an automatic restart will not endanger personnel or equipment in any way.**	
tAr	**Max. duration of restart process**	5
	5: 5 minutes 10: 10 minutes 30: 30 minutes 1h: 1 hour 2h: 2 hours 3h: 3 hours Ct: Unlimited This parameter appears if Atr = YES. It can be used to limit the number of consecutive restarts on a recurrent fault.	
rSF	**Reset of current fault**	no
	nO: Not assigned LI1: Logic input LI1 LI2: Logic input LI2 LI3: Logic input LI3 LI4: Logic input LI4 LI5: Logic input LI5 LI6: Logic input LI6	

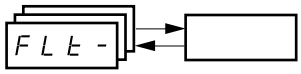
These parameters only appear if the function has been enabled.

Fault menu FLt-



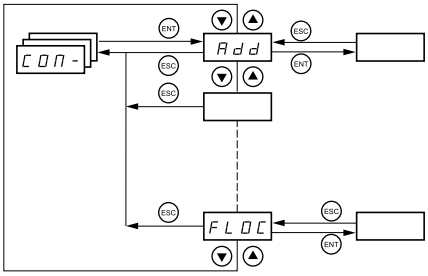
Code	Description	Factory setting
FLr	**Flying restart** (automatic catching a spinning load on ramp)	nO
	Used to enable a smooth restart if the run command is maintained after the following events: - Loss of line supply or disconnection - Reset of current fault or automatic restart - Freewheel stop The speed given by the drive resumes from the estimated speed of the motor at the time of the restart, then follows the ramp to the reference speed. This function requires 2-wire control (tCC = 2C) with tCt = LEL or PFO. nO: Function inactive YES: Function active When the function is operational, it activates at each run command, resulting in a slight delay (1 second max.). FLr is forced to nO if brake control (bLC) is assigned (page 54).	
EtF	**External fault**	nO
	nO: Not assigned LI1: Logic input LI1 LI2: Logic input LI2 LI3: Logic input LI3 LI4: Logic input LI4 LI5: Logic input LI5 LI6: Logic input LI6 If LAC = L3, the following assignments are possible: Cd11: Bit 11 of the Modbus or CANopen control word Cd12: Bit 12 of the Modbus or CANopen control word Cd13: Bit 13 of the Modbus or CANopen control word Cd14: Bit 14 of the Modbus or CANopen control word Cd15: Bit 15 of the Modbus or CANopen control word	
EPL	**Stop mode in the event of an external fault EPF**	YES
	nO: Fault ignored YES: Fault with freewheel stop rMP: Fault with stop on ramp FSt: Fault with fast stop	
OPL	**Configuration of motor phase loss fault**	YES
	nO: Function inactive YES: Triggering of OPF fault OAC: No fault triggered but management of the output voltage in order to avoid an overcurrent when the link with the motor is re-established and flying restart even if FLr = nO. To be used with downstream contactor. OPL is forced to YES if brake control (bLC) is assigned (page 54).	
IPL	**Configuration of line phase loss fault**	YES
	This parameter is only accessible on 3-phase drives. nO: Fault ignored YES: Fault with fast stop	
OHL	**Stop mode in the event of a drive overheating fault OHF**	YES
	nO: Fault ignored YES: Fault with freewheel stop rMP: Fault with stop on ramp FSt: Fault with fast stop	
OLL	**Stop mode in the event of a motor overload fault OLF**	YES
	nO: Fault ignored YES: Fault with freewheel stop rMP: Fault with stop on ramp FSt: Fault with fast stop	

Fault menu FLt-

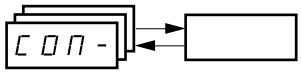


Code	Description	Adjustment range	Factory setting
SLL	**Stop mode in the event of a Modbus serial link fault SLF**		YES
	nO: Fault ignored YES: Fault with freewheel stop rMP: Fault with stop on ramp FSt: Fault with fast stop		
COL	**Stop mode in the event of a CANopen serial link fault COF**		YES
	nO: Fault ignored YES: Fault with freewheel stop rMP: Fault with stop on ramp FSt: Fault with fast stop		
tnL	**Configuration of auto-tuning fault tnF**		YES
	nO: Fault ignored (the drive reverts to the factory settings) YES: Fault with drive locked		
LFL	**Stop mode in the event of a loss of 4 - 20 mA signal fault LFF**		nO
	nO: Fault ignored (only value possible if CrL3 ⩽ 3 mA, see page 24) YES: Fault with freewheel stop LFF: The drive switches to the fallback speed (LFF parameter) rLS: The drive maintains the speed at which it was travelling when the fault occurred until the fault has disappeared. rMP: Fault with stop on ramp FSt: Fault with fast stop ⚠ Before setting LFL to YES , rMP or FSt, check the connection of input AI3. Otherwise, the drive may immediately switch to an LFF fault.		
LFF	**Fallback speed**	0 to 500 Hz	10 Hz
	Fallback speed setting for stopping in the event of a fault		
drn	**Derated operation in the event of an overvoltage**		nO
	nO: Function inactive YES: The line voltage monitoring threshold is: ATV31●●●M2: 130 V ATV31●●●M3X: 130 V ATV31●●●N4: 270 V ATV31●●●S6X: 340 V In this case, a line choke must be used and the performance of the drive cannot be guaranteed. In order to assign this function, you must press and hold down the "ENT" key for 2 seconds.		
StP	**Controlled stop on mains power break**		nO
	nO: Locking of the drive and freewheel stopping of the motor rMP: Stop according to the valid ramp (dEC or dE2) FSt: Fast stop, the stopping time depends on the inertia and the braking ability of the drive.		
InH	**Fault inhibit**		nO
	⚠ Inhibiting faults may damage the drive beyond repair. This would invalidate the guarantee. nO: Not assigned LI1: Logic input LI1 LI2: Logic input LI2 LI3: Logic input LI3 LI4: Logic input LI4 LI5: Logic input LI5 LI6: Logic input LI6 Fault monitoring is active when the input is in state 0. It is inactive when the input is in state 1. All active faults are reset on a rising edge (from 1 to 0) of the input. In order to assign this function, you must press and hold down the "ENT" key for 2 seconds.		
rPr	**Operating time reset to zero**		nO
	nO: No rtH: Operating time reset to zero The rPr parameter automatically falls back to nO as soon as the reset to zero is performed.		

Communication menu COM-



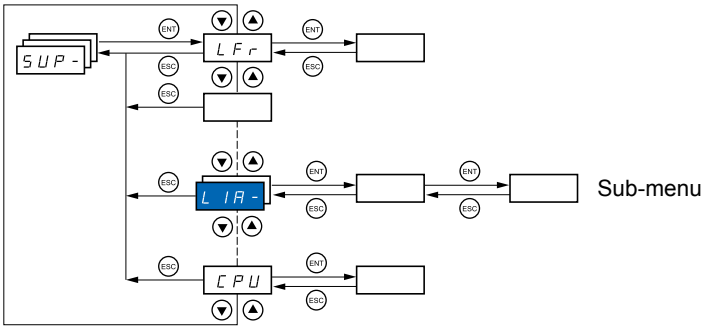
The parameters can only be modified when the drive is stopped and no run command is present. Modifications to parameters Add, tbr, tFO, AdCO and bdCO are only taken into account following a restart.
On the optional remote terminal, this menu can be accessed with the switch in the position.



Code	Description	Adjustment range	Factory setting
Add	**Modbus: Drive address**	1 to 247	1
tbr	**Modbus: Transmission speed**		19200
	4.8: 4800 bps 9.6: 9600 bps 19.2: 19200 bps (**Caution:** The remote terminal can only be used with this value.)		
tFO	**Modbus communication format**		8E1
	8O 1: 8 data bits, odd parity, 1 stop bit 8E 1: 8 data bits, even parity, 1 stop bit (**Caution:** The remote terminal can only be used with this value.) 8n 1: 8 data bits, no parity, 1 stop bit 8n2: 8 data bits, no parity, 2 stop bits		
ttO	**Modbus: Time-out**	0.1 to 10 s	10 s
AdCO	**CANopen: Drive address**	0 to 127	0
bdCO	**CANopen: Transmission speed**		125
	10.0: 10 kbps 20.0: 20 kbps 50.0: 50 kbps 125.0: 125 kbps 250.0: 250 kbps 500.0: 500 kbps 1000: 1000 kbps		
ErCO	**CANopen: Error registry** (read-only)		
	0: "No error" 1: "Bus off error" 2: "Life time error" 3: "CAN overrun" 4: "Heartbeat error"		
FLO	**Forced local mode**		nO
	nO: Not assigned LI1: Logic input LI1 LI2: Logic input LI2 LI3: Logic input LI3 LI4: Logic input LI4 LI5: Logic input LI5 LI6: Logic input LI6 In forced local mode, the terminal block and display terminal regain control of the drive.		
FLOC	**Selection of the reference and control channel in forced local mode** Can only be accessed if LAC = 3		AI1 AIP for ATV31●●●A
	In forced local mode, only the speed reference is taken into account. PI functions, summing inputs, etc. are not active. See the diagrams on pages 28 to 31. AI1: Analog input AI1, logic inputs LI AI2: Analog input AI2, logic inputs LI AI3: Analog input AI3, logic inputs LI AIP: Potentiometer (type A drives only), RUN/STOP buttons LCC: Remote terminal: LFr reference page 16, RUN/STOP/FWD/REV buttons.		

These parameters only appear if the function has been enabled.

Display menu SUP-



Parameters can be accessed with the drive running or stopped.
On the optional remote terminal, this menu can be accessed with the switch in any position.

Some functions have numerous parameters. In order to clarify programming and avoid having to scroll through endless parameters, these functions have been grouped in sub-menus.
Like menus, sub-menus are identified by a dash after their code: LIA- for example.

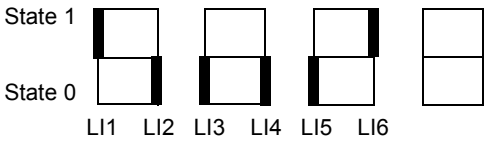
When the drive is running, the value displayed is that of one of the monitoring parameters. By default, the value displayed is the output frequency applied to the motor (rFr parameter).
Whilst the value of the new monitoring parameter required is being displayed, press and hold down the "ENT" key (2 seconds) to confirm the change of monitoring parameter and store this. From now on, the value of this parameter will be displayed while the drive is running (even after it has been disconnected).
If the new choice is not confirmed by pressing the "ENT" key a second time, the drive will return to the previous parameter after it has been switched off.

Display menu SUP-

Code	Description	Variation range
LFr	**Frequency reference for control via built-in terminal or remote terminal**	0 to 500 Hz
rPI	**Internal PI reference**	0 to 100%
FrH	**Frequency reference before ramp** (absolute value)	0 to 500 Hz
rFr	**Output frequency applied to the motor**	- 500 Hz to + 500 Hz
SPd1 or SPd2 or SPd3	**Output value in customer units** SPd1 or SPd2 or SPd3 depending on the SdS parameter, see page 19 (SPd3 in factory settings mode).	
LCr	**Current in the motor**	
OPr	**Motor power**	
	100% = Nominal motor power, calculated using the parameters entered in the drC- menu.	
ULn	**Line voltage** (gives the line voltage via the DC bus, motor running or stopped)	
tHr	**Motor thermal state**	
	100% = Nominal thermal state 118% = "OLF" threshold (motor overload)	
tHd	**Drive thermal state**	
	100% = Nominal thermal state 118% = "OHF" threshold (motor overload)	
LFt	**Last fault**	
	bLF: Brake control fault CFF: Configuration (parameters) incorrect CFI: Configuration (parameters) invalid COF: Communication fault line 2 (CANopen) CrF: Capacitor pre-charge fault EEF: EEPROM memory fault EPF: External fault InF: Internal fault LFF: 4 - 20 mA fault on AI3 nOF: No fault saved ObF: DC bus overvoltage fault OCF: Overcurrent fault OHF: Drive overheating fault OLF: Motor overload fault OPF: Motor phase loss fault OSF: Line supply overvoltage fault PHF: Line supply phase loss fault SCF: Motor short-circuit fault (phase, earth) SLF: Modbus communication fault SOF: Motor overspeed fault tnF: Auto-tuning fault USF: Line supply undervoltage fault	
Otr	**Motor torque**	
	100% = Nominal motor torque, calculated using the parameters entered in the drC- menu.	
rtH	Operating time	0 to 65530 hours
	Total time the motor has been powered up: 0 to 9999 (hours), then 10.00 to 65.53 (kilo-hours). Can be reset to zero by the rPr parameter in the FLt- menu (see page 62).	

These parameters only appear if the function has been enabled.

Display menu SUP-

Code		Description
	COd	**Terminal locking code**
		Enables the drive configuration to be protected using an access code. ⚠ **Caution: Before entering a code, do not forget to make a careful note of it.** • OFF: No access locking codes - To lock access, enter a code (2 to 9999). The display can be incremented using ▲. Now press "ENT". "On" appears on the screen to indicate that the parameters have been locked. • On: A code is locking access (2 to 9999) - **To unlock access**, enter the code (incrementing the display using ▲) and press "ENT". The code remains on the display and access is unlocked until the next power down. Parameter access will be locked again on the next power-up. - **If an incorrect code is entered**, the display changes to "On" and the parameters remain locked. • XXXX: Parameter access is unlocked (the code remains on the screen). - **To reactivate locking with the same code** when the parameters have been unlocked, return to "On" using the ▼ button then press "ENT". "On" appears on the screen to indicate that the parameters have been locked. - **To lock access with a new code** when the parameters have been unlocked, enter a new code (increment the display using ▲ or ▼) and press "ENT". "On" appears on the screen to indicate that the parameters have been locked. - **To clear locking** when the parameters have been unlocked, return to "OFF" using the ▼ button and press "ENT". "OFF" remains on the screen. The parameters are unlocked and will remain unlocked until the next restart. When access is locked using a code, only the monitoring parameters can be accessed, with only a temporary choice of parameter displayed.
	tUS	**State of auto-tuning**
		tAb: The default stator resistance value is used to control the motor. PEnd: Auto-tuning has been requested but not yet performed. PrOG: Auto-tuning in progress. FAIL: Auto-tuning has failed. dOnE: The stator resistance measured by the auto-tuning function is used to manage the drive. Strd: The cold stator resistance (rSC other than nO) that is used to control the motor.
	UdP	**Indicates the ATV31 firmware version**. E.g.: 1102 = V1.1 IE02.
LIA-		**Logic input functions**
	LI1A LI2A LI3A LI4A LI5A LI6A	Can be used to display the functions assigned to each input. If no functions have been assigned, nO is displayed. Use the ▲ and ▼ arrows to scroll through the functions. If a number of functions have been assigned to the same input, check that they are compatible.
	LIS	Can be used to display the state of the logic inputs (using the segments of the display: high = 1, low = 0)  Example above: LI1 and LI6 are at 1, LI2 to LI5 are at 0.
AIA-		**Analog input functions**
	AI1A AI2A AI3A	Can be used to display the functions assigned to each input. If no functions have been assigned, nO is displayed. Use the ▲ and ▼ arrows to scroll through the functions. If a number of functions have been assigned to the same input, check that they are compatible.

Maintenance

Servicing

The Altivar 31 does not require any preventative maintenance. It is nevertheless advisable to perform the following regularly:
- Check the condition and tightness of connections.
- Ensure that the temperature around the unit remains at an acceptable level and that ventilation is effective (average service life of fans: 3 to 5 years depending on the operating conditions).
- Remove any dust from the drive.

Assistance with maintenance, fault display

If a problem arises during setup or operation, ensure that the recommendations relating to the environment, mounting and connections have been observed.

The first fault detected is stored and displayed, flashing, on the screen: the drive locks and the fault relay (RA - RC) contact opens, if it has been configured for this function.

Clearing the fault

Cut the power supply to the drive in the event of a non-resettable fault.
Wait for the display to go off completely.
Find the cause of the fault in order to correct it.

The drive is unlocked after a fault by:
- Switching off the drive until the display disappears completely, then switching on again
- Automatically in the cases described in the "automatic restart" function (FLt- menu, Atr = YES)
- Via a logic input when this input is assigned to the "fault reset" function (FLt- menu, rSF = LI●)

Monitoring menu:

This is used to prevent and find the causes of faults by displaying the drive status and its current values.

Spares and repairs:

Consult Schneider Electric product support.

Faults - Causes - Remedies

Drive does not start, no fault displayed

- If the display does not light up, check the power supply to the drive.
- The assignment of the "Fast stop" or "Freewheel stop" functions will prevent the drive from starting if the corresponding logic inputs are not powered up. The ATV31 then displays "nSt" in freewheel stop mode and "FSt" in fast stop mode. This is normal since these functions are active at zero so that the drive will be stopped safely if there is a wire break.
- Check that the run command input(s) have been actuated in accordance with the chosen control mode (tCC parameter in the I-O- menu).
- If an input is assigned to the limit switch function and this input is at zero, the drive can only be started up by sending a command for the opposite direction (see page 58).
- If the reference channel (page 28) or the control channel (page 29) is assigned to Modbus or CANopen, the drive displays nSt on power-up and remains at stop until the communication bus sends a command.

Faults which cannot be reset automatically

The cause of the fault must be removed before resetting by switching off and then on again.
CrF, SOF, tnF, bLF and OPF faults can also be reset remotely via logic input (rSF parameter in the FLt- menu page 60).

Fault	Probable cause	Remedy
bLF Brake sequence	• Brake release current not reached • Brake engage frequency bEn = nO (not adjusted) when brake logic bLC is assigned.	• Check the drive/motor connection. • Check the motor windings. • Check the Ibr setting in the FUn- menu (see page 54). • Carry out the recommended adjustment of bEn (see pages 53 and 54).
CrF Capacitor load circuit	• Load relay control fault or charging resistor damaged	• Replace the drive.
EEF EEPROM fault	• Internal memory fault	• Check the environment (electromagnetic compatibility). • Replace the drive.
InF Internal fault	• Internal fault	• Check the environment (electromagnetic compatibility). • Replace the drive.
OCF Overcurrent	• Incorrect parameters in the SEt- and drC- menus • Inertia or load too high • Mechanical blockage	• Check the SEt- and drC- parameters. • Check the size of the motor/drive/load. • Check the state of the mechanism.
SCF Motor short-circuit	• Short-circuit or earthing at the drive output • Significant earth leakage current at the drive output when several motors are connected in parallel	• Check the cables connecting the drive to the motor, and the motor insulation. • Reduce the switching frequency. • Connect chokes in series with the motor.
SOF Overspeed	• Instability or • Driving load too high	• Check the motor, gain and stability parameters. • Add a braking resistor. • Check the size of the motor/drive/load.
tnF Auto-tuning fault	• Special motor or motor whose power is not suitable for the drive • Motor not connected to the drive	• Use the L or the P ratio (see Uft page 21). • Check the presence of the motor during auto-tuning. • If a downstream contactor is being used, close it during auto-tuning.

Faults - Causes - Remedies

Faults which can be reset with the automatic restart function, after the cause has disappeared

These faults can also be reset by switching the drive off and on again or via a logic input (rSF parameter in the FLt- menu page 60)

Fault	Probable cause	Remedy
COF CAnopen fault	• Interruption in communication on the CANopen bus	• Check the communication bus. • Please refer to the product-specific documentation.
EPF External fault	• According to user	• According to user
LFF Loss of 4-20mA	• Loss of the 4-20 mA reference on input AI3	• Check the connection on input AI3.
ObF Overvoltage during deceleration	• Braking too sudden or driving load	• Increase the deceleration time. • Install a braking resistor if necessary. • Activate the brA function (page 38) if it is compatible with the application.
OHF Drive overheated	• Drive temperature too high	• Check the motor load, the drive ventilation and the environment. Wait for the drive to cool down before restarting.
OLF Motor overload	• Triggered by excessive motor current	• Check the ItH setting (motor thermal protection) (page 16), check the motor load. Wait for the drive to cool down before restarting.
OPF Motor phase loss	• Loss of one phase at drive output • Downstream contactor open • Motor not connected or motor power too low • Instantaneous instability in the motor current	• Check the connections from the drive to the motor. • If a downstream contactor is being used, set OPL to OAC (FLt- menu page 61). • Test on a low power motor or without a motor: In factory settings mode, motor phase loss detection is active (OPL = YES). To check the drive in a test or maintenance environment without having to switch to a motor with the same rating as the drive (particularly useful in the case of high power drives), deactivate motor phase loss detection (OPL = no). • Check and optimize the UFr (page 17), UnS and nCr (page 20) parameters and perform auto-tuning with tUn (page 21).
OSF Overvoltage	• Line voltage too high • Disturbed line supply	• Check the line voltage.
PHF Line phase failure	• Drive incorrectly supplied or a fuse blown • Failure of one phase • 3-phase ATV31 used on a single phase line supply • Unbalanced load This protection only operates with the drive on load.	• Check the power connection and the fuses. • Reset. • Use a 3-phase line supply. • Disable the fault by setting IPL = nO (FLt- menu page 61).
SLF Modbus fault	• Interruption in communication on the Modbus bus	• Check the communication bus. • Please refer to the product-specific documentation.

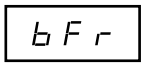
Faults which can be reset as soon as their cause disappears

Fault	Probable cause	Remedy
CFF Configuration fault	• The current configuration is inconsistent.	• Return to factory settings or call up the backup configuration, if it is valid. See the FCS parameter in the I-O-, drC-, CtL- or FUn- menu.
CFI Configuration fault via serial link	• Invalid configuration The configuration loaded in the drive via the serial link is inconsistent.	• Check the configuration loaded previously. • Load a consistent configuration.
USF Undervoltage	• Line supply too low • Transient voltage dip • Damaged load resistor	• Check the voltage and the voltage parameter. • Replace the drive.

Configuration/Settings table

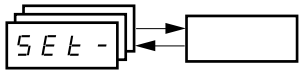
Drive ATV 31.....
Customer ID no. (if applicable).....

1st level adjustment parameter



Code	Factory setting	Customer setting
bFr	50	

Settings menu



Code	Factory setting	Customer setting	
ACC	3 s		s
AC2	5 s		s
dE2	5 s		s
dEC	3 s		s
tA1	10%		%
tA2	10%		%
tA3	10%		%
tA4	10%		%
LSP	0 Hz		Hz
HSP	bFr		Hz
ItH	According to drive rating		A
UFr	20%		%
FLG	20%		%
StA	20%		%
SLP	100 Hz		%
IdC	0.7 In (1)		A
tdC	0.5 s		s
tdC1	0.5 s		s
SdC1	0.7 In (1)		A
tdC2	0 s		s
SdC2	0.5 In (1)		A
JPF	0 Hz		Hz
JF2	0 Hz		Hz
JGF	10 Hz		Hz
rPG	1		
rIG	1 / s		/ s
FbS	1		
PIC	nO		

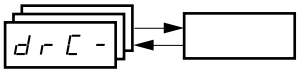
Code	Factory setting	Customer setting	
rP2	30%		%
rP3	60%		%
rP4	90%		%
SP2	10 Hz		Hz
SP3	15 Hz		Hz
SP4	20 Hz		Hz
SP5	25 Hz		Hz
SP6	30 Hz		Hz
SP7	35 Hz		Hz
SP8	40 Hz		Hz
SP9	45 Hz		Hz
SP10	50 Hz		Hz
SP11	55 HZ		Hz
SP12	60 Hz		Hz
SP13	70 Hz		Hz
SP14	80 Hz		Hz
SP15	90 Hz		Hz
SP16	100 Hz		Hz
CL1	1.5 In (1)		A
CL2	1.5 In (1)		A
tLS	0 (no time limit)		s
rSL	0		
UFr2	20%		%
FLG2	20%		%
StA2	20%		%
SLP2	100%		%
Ftd	bFr		Hz
ttd	100%		%
Ctd	In (1)		A
SdS	30		
SFr	4 kHz		kHz

(1) In corresponds to the nominal drive current indicated in the Installation Manual and on the drive rating plate.

These parameters only appear if the corresponding function has been selected in another menu. The majority can also be accessed and adjusted in the function configuration menu.
Those which are underlined appear in factory settings mode.

Configuration/Settings table

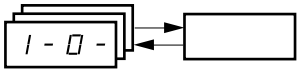
Motor control menu



Code	Factory setting	Customer setting
bFr	50 Hz	Hz
UnS	According to drive rating	V
FrS	50 Hz	Hz
nCr	According to drive rating	A
nSP	According to drive rating	RPM
COS	According to drive rating	
rSC	nO	

Code	Factory setting	Customer setting
tUS	tAb	
UFt	n	
nrd	YES	
SFr	4 kHz	kHz
tFr	60 Hz	Hz
SrF	nO	

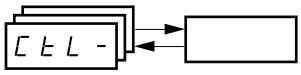
I/O menu



Code	Factory setting	Customer setting
tCC	2C ATV31●●●A: LOC	
tCt	trn	
rrS	if tCC = 2C, LI2 if tCC = 3C, LI3 if tCC = LOC: nO	
CrL3	4 mA	mA
CrH3	20 mA	mA

Code	Factory setting	Customer setting
AOIt	0A	
dO	nO	
r1	FLt	
r2	nO	

Control menu



Code	Factory setting	Customer setting
LAC	L1	
Fr1	AI1 AIP for ATV31●●●A	
Fr2	nO	
rFC	Fr1	
CHCF	SIM	
Cd1	tEr LOC for ATV31●●●A	

Code	Factory setting	Customer setting
Cd2	Mdb	
CCS	Cd1	
COP	nO	
LCC	nO	
PSt	YES	
rOt	dFr	

These parameters only appear if the corresponding function has been enabled.

Configuration/Settings table

Application functions menu

Code		Factory setting	Customer setting
rPC-	rPt	LIn	
	tA1	10%	%
	tA2	10%	%
	tA3	10%	%
	tA4	10%	%
	ACC	3 s	s
	dEC	3 s	s
	rPS	nO	
	Frt	0	Hz
	AC2	5 s	s
	dE2	5 s	s
	brA	YES	
StC-	Stt	Stn	
	FSt	nO	
	dCF	4	
	dC I	nO	
	IdC	0.7 In	A
	tdC	0.5 s	s
	nSt	nO	
AdC-	AdC	YES	
	tdC I	0.5 s	s
	SdC I	0.7 In (1)	A
	tdC2	0 s	s
	SdC2	0.5 In (1)	A
SA I-	SA2	AI2	
	SA3	nO	
PSS-	PS2	If tCC = 2C: LI3 If tCC = 3C: LI4 If tCC = LOC: LI3	
	PS4	If tCC = 2C: LI4 If tCC = 3C: nO If tCC = LOC: LI4	
	PS8	nO	
	PS16	nO	
	SP2	10 Hz	Hz
	SP3	15 Hz	Hz
	SP4	20 Hz	Hz
	SP5	25 Hz	Hz
	SP6	30 Hz	Hz
	SP7	35 Hz	Hz
	SP8	40 Hz	Hz
	SP9	45 Hz	Hz
	SP10	50 Hz	Hz
	SP11	55 Hz	Hz
	SP12	60 Hz	Hz
	SP13	70 Hz	Hz
	SP14	80 Hz	Hz
	SP15	90 Hz	Hz
	SP16	100 Hz	Hz

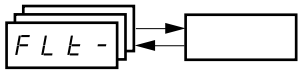
Code		Factory setting	Customer setting
JOG-	JOG	If tCC = 2C: nO If tCC = 3C: LI4 If tCC = LOC: nO	
	JGF	10 Hz	Hz
UPd-	USP	nO	
	dSP	nO	
	Str	nO	
PI-	PIF	nO	
	rPG	1	
	rIG	1	
	FbS	1	
	PIC	nO	
	Pr2	nO	
	Pr4	nO	
	rP2	30%	%
	rP3	60%	%
	rP4	90%	%
	rSL	0	
	PII	nO	
	rPI	0%	%
bLC-	bLC	nO	
	brL	According to drive rating	Hz
	Ibr		A
	brt	0.5 s	s
	bEn	nO	Hz
	bEt	0.5 s	s
	bIP	nO	
LC2-	LC2	nO	
	CL2	1.5 In (1)	A
CHP-	CHP	nO	
	UnS2	According to drive rating	V
	FrS2	50 Hz	Hz
	nCr2	According to drive rating	A
	nSP2		RPM
	COS2		
	UFt2	n	
	UFr2	20%	%
	FLG2	20%	%
	StA2	20%	%
	SLP2	100 Hz	Hz
LSt-	LAF	nO	
	LAr	nO	
	LAS	nSt	

(1) In corresponds to the nominal drive current indicated in the Installation Manual and on the drive rating plate.

These parameters only appear if the corresponding function has been enabled. They can also be accessed in the SEt menu.

Configuration/Settings table

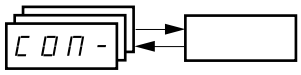
Fault menu



Code	Factory setting	Customer setting
Atr	nO	
tAr	5	
rSF	nO	
FLr	nO	
EtF	nO	
EPL	YES	
OPL	YES	
IPL	YES	
OHL	YES	
OLL	YES	

Code	Factory setting	Customer setting
SLL	YES	
COL	YES	
tnL	YES	
LFL	nO	
LFF	10 Hz	Hz
drn	nO	
StP	nO	
InH	nO	
rPr	nO	

Communication menu



Code	Factory setting	Customer setting
Add	1	
tbr	19200	
tFO	8E1	
ttO	10 s	s
AdCO	0	

Code	Factory setting	Customer setting
bdCO	125	
FLO	nO	
FLOC	AI1 AIP for ATV31●●●A	

These parameters only appear if the corresponding function has been enabled.

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Altivar 31H

Installation manual

Variable speed drives
for asynchronous motors

a brand of
Schneider
Electric

Telemecanique

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NOTE: Please also refer to the Programming Manual.

When the drive is powered up, the power components and some of the control components are connected to the line supply. It is extremely dangerous to touch them. *The drive cover must be kept closed.*

In general, the drive power supply must be disconnected before any operation on either the electrical or mechanical parts of the installation or *machine.*
After the ALTIVAR has been switched off and the display has disappeared completely, *wait for 10 minutes before working on the equipment.* This is the time required for the capacitors to discharge.
The motor can be stopped during operation by inhibiting start commands or the speed reference while the drive remains powered up. If personnel safety requires prevention of sudden restarts, this electronic locking system is not sufficient: *fit a cut-off on the power circuit.*.

The drive is fitted with safety devices which, in the event of a fault, can shut down the drive and consequently the motor. The motor itself may be stopped by a mechanical blockage. Finally, voltage variations, especially line supply failures, can also cause shutdowns.
If the cause of the shutdown disappears, there is a risk of restarting which may endanger certain machines or installations, especially those which must conform to safety regulations.

In this case the user must take precautions against the possibility of restarts, in particular by using a low speed detector to cut off power to the drive if the motor performs an unprogrammed shutdown.

The drive must be installed and set up in accordance with both international and national standards. Bringing the device into conformity is the responsibility of the systems integrator who must observe the EMC directive among others within the European Union.
The specifications contained in this document must be applied in order to comply with the essential requirements of the EMC directive.

The Altivar 31 must be considered as a component: it is neither a machine nor a device ready for use in accordance with European directives (machinery directive and electromagnetic compatibility directive). It is the responsibility of the end user to ensure that the machine meets these standards.

The drive must not be used as a safety device for machines posing a potential risk of material damage or personal injury (lifting equipment, for example). In such applications, overspeed checks and checks to ensure that the trajectory remains under constant control must be made by separate devices which are independent of the drive.

The products and equipment described in this document may be changed or modified at any time, either from a technical point of view or in the way they are operated. Their description can in no way be considered contractual.

Drive references

Single phase supply voltage: 200…240 V 50/60 Hz

3-phase motor 200…240 V

Motor	Line supply (input)					Drive (output)			Altivar 31
Power indicated on plate (1)	Max. line current (2)		Max. prospective line Isc	Apparent power	Max. inrush current (3)	Nominal current In (1)	Max. transient current (1) (4)	Power dissipated at nominal load	Reference (5)
	at 200 V	at 240 V							
kW/HP	A	A	kA	kVA	A	A	A	W	
0.18/0.25	3.0	2.5	1	0.6	10	1.5	2.3	24	**ATV31H018M2**
0.37/0.5	5.3	4.4	1	1.0	10	3.3	5.0	41	**ATV31H037M2**
0.55/0.75	6.8	5.8	1	1.4	10	3.7	5.6	46	**ATV31H055M2**
0.75/1	8.9	7.5	1	1.8	10	4.8/4.2 (6)	7.2	60	**ATV31H075M2**
1.1/1.5	12.1	10.2	1	2.4	19	6.9	10.4	74	**ATV31HU11M2**
1.5/2	15.8	13.3	1	3.2	19	8.0	12.0	90	**ATV31HU15M2**
2.2/3	21.9	18.4	1	4.4	19	11.0	16.5	123	**ATV31HU22M2**

3-phase supply voltage: 200…240 V 50/60 Hz

3-phase motor 200…240 V

Motor	Line supply (input)					Drive (output)			Altivar 31
Power indicated on plate (1)	Max. line current (2)		Max. prospective line Isc	Apparent power	Max. inrush current (3)	Nominal current In (1)	Max. transient current (1) (4)	Power dissipated at nominal load	Reference (5)
	at 200 V	at 240 V							
kW/HP	A	A	kA	kVA	A	A	A	W	
0.18/0.25	2.1	1.9	5	0.7	10	1.5	2.3	23	**ATV31H018M3X**
0.37/0.5	3.8	3.3	5	1.3	10	3.3	5.0	38	**ATV31H037M3X**
0.55/0.75	4.9	4.2	5	1.7	10	3.7	5.6	43	**ATV31H055M3X**
0.75/1	6.4	5.6	5	2.2	10	4.8	7.2	55	**ATV31H075M3X**
1.1/1.5	8.5	7.4	5	3.0	10	6.9	10.4	71	**ATV31HU11M3X**
1.5/2	11.1	9.6	5	3.8	10	8.0	12.0	86	**ATV31HU15M3X**
2.2/3	14.9	13.0	5	5.2	10	11.0	16.5	114	**ATV31HU22M3X**
3/3	19.1	16.6	5	6.6	19	13.7	20.6	146	**ATV31HU30M3X**
4/5	24.2	21.1	5	8.4	19	17.5	26.3	180	**ATV31HU40M3X**
5.5/7.5	36.8	32.0	22	12.8	23	27.5	41.3	292	**ATV31HU55M3X**
7.5/10	46.8	40.9	22	16.2	23	33.0	49.5	388	**ATV31HU75M3X**
11/15	63.5	55.6	22	22.0	93	54.0	81.0	477	**ATV31HD11M3X**
15/20	82.1	71.9	22	28.5	93	66.0	99.0	628	**ATV31HD15M3X**

(1) These power ratings and currents are for a maximum ambient temperature of 50°C and a switching frequency of 4 kHz in continuous operation.The switching frequency is adjustable from 2 to 16 kHz.
Above 4 kHz, the drive will reduce the switching frequency in the event of excessive temperature rise. The temperature rise is controlled by a PTC probe in the power module. Nonetheless, the nominal drive current should be derated if operation above 4 kHz needs to be continuous.
Derating curves are shown on page 6 as a function of switching frequency, ambient temperature and mounting conditions.

(2) Current on a line supply with the "Max. prospective line Isc" indicated.

(3) Peak current on power-up, for the max. voltage (240 V + 10%).

(4) For 60 seconds.

(5) Reference for a drive with built-in terminal but no control unit. For a drive with control potentiometer and RUN/STOP buttons, add an A at the end of the reference, e.g.: ATV31H018M2A.

(6) 4.8 A at 200 V/4.6 A at 208 V/4.2 A at 230 V and 240 V.

Drive references

3-phase supply voltage: 380…500 V 50/60 Hz

3-phase motor 380…500 V

Motor	Line supply (input)					Drive (output)			Altivar 31
Power indicated on plate (1)	Max. line current (2)		Max. prospective line Isc	Apparent power	Max. inrush current (3)	Nominal current In (1)	Max. transient current (1) (4)	Power dissipated at nominal load	Reference (5)
	at 380 V	at 500 V							
kW/HP	A	A	kA	kVA	A	A	A	W	
0.37/0.5	2.2	1.7	5	1.5	10	1.5	2.3	32	**ATV31H037N4**
0.55/0.75	2.8	2.2	5	1.8	10	1.9	2.9	37	**ATV31H055N4**
0.75/1	3.6	2.7	5	2.4	10	2.3	3.5	41	**ATV31H075N4**
1.1/1.5	4.9	3.7	5	3.2	10	3.0	4.5	48	**ATV31HU11N4**
1.5/2	6.4	4.8	5	4.2	10	4.1	6.2	61	**ATV31HU15N4**
2.2/3	8.9	6.7	5	5.9	10	5.5	8.3	79	**ATV31HU22N4**
3/3	10.9	8.3	5	7.1	10	7.1	10.7	125	**ATV31HU30N4**
4/5	13.9	10.6	5	9.2	10	9.5	14.3	150	**ATV31HU40N4**
5.5/7.5	21.9	16.5	22	15.0	30	14.3	21.5	232	**ATV31HU55N4**
7.5/10	27.7	21.0	22	18.0	30	17.0	25.5	269	**ATV31HU75N4**
11/15	37.2	28.4	22	25.0	97	27.7	41.6	397	**ATV31HD11N4**
15/20	48.2	36.8	22	32.0	97	33.0	49.5	492	**ATV31HD15N4**

3-phase supply voltage: 525…600 V 50/60 Hz

3-phase motor 525…600 V

Motor	Line supply (input)					Drive (output)			Altivar 31
Power indicated on plate (1)	Max. line current (2)		Max. prospective line Isc	Apparent power	Max. inrush current (3)	Nominal current In (1)	Max. transient current (1) (4)	Power dissipated at nominal load	Reference
	at 525 V	at 600 V							
kW/HP	A	A	kA	kVA	A	A	A	W	
0.75/1	2.8	2.4	5	2.5	12	1.7	2.6	36	**ATV31H075S6X**
1.5/2	4.8	4.2	5	4.4	12	2.7	4.1	48	**ATV31HU15S6X**
2.2/3	6.4	5.6	5	5.8	12	3.9	5.9	62	**ATV31HU22S6X**
4/5	10.7	9.3	5	9.7	12	6.1	9.2	94	**ATV31HU40S6X**
5.5/7.5	16.2	14.1	22	15.0	36	9.0	13.5	133	**ATV31HU55S6X**
7.5/10	21.3	18.5	22	19.0	36	11.0	16.5	165	**ATV31HU75S6X**
11/15	27.8	24.4	22	25.0	117	17.0	25.5	257	**ATV31HD11S6X**
15/20	36.4	31.8	22	33.0	117	22.0	33.0	335	**ATV31HD15S6X**

(1) These power ratings and currents are for a maximum ambient temperature of 50°C and a switching frequency of 4 kHz in continuous operation. The switching frequency is adjustable from 2 to 16 kHz.
Above 4 kHz, the drive will reduce the switching frequency in the event of excessive temperature rise. The temperature rise is controlled by a PTC probe in the power module. Nonetheless, the nominal drive current should be derated if operation above 4 kHz needs to be continuous.
Derating curves are shown on page 6 as a function of switching frequency, ambient temperature and mounting conditions.

(2) Current on a line supply with the "Max. prospective line Isc" indicated.

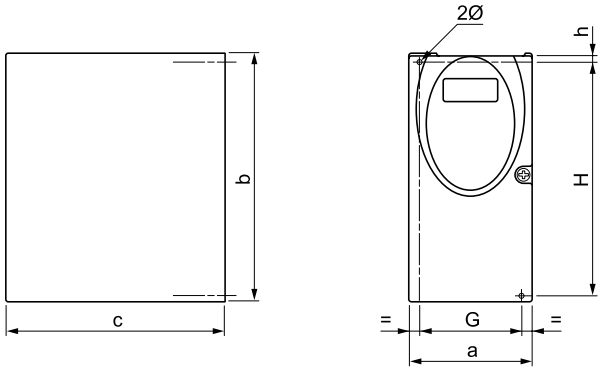
(3) Peak current on power-up, for the max. voltage (500 V + 10%, 600 V + 10%).

(4) For 60 seconds.

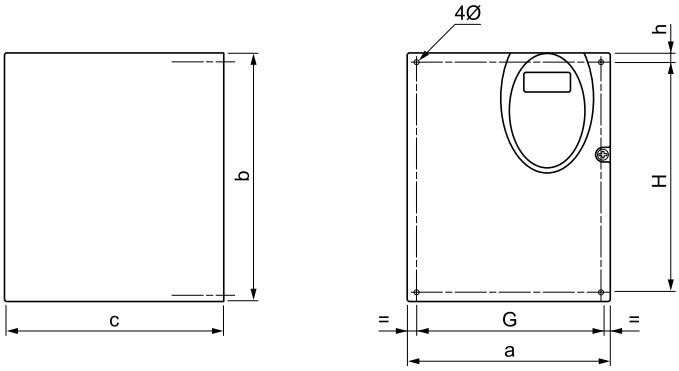
(5) Reference for a drive with built-in terminal but no control unit. For a drive with control potentiometer and RUN/STOP buttons, add an A at the end of the reference, e.g.: ATV31H037N4A.

Mounting

Dimensions and weights



ATV31		a mm	b mm	c (1) mm	G mm	hr mm	H mm	Ø mm	For screw	Weight kg
H018M3X, H037M3X	Size 1	72	145	120	60±1	5	121.5±1	2 x 5	M4	0.9
H055M3X, H075M3X	Size 2	72	145	130	60±1	5	121.5±1	2 x 5	M4	0.9
H018M2, H037M2	Size 3	72	145	130	60±1	5	121.5±1	2 x 5	M4	1.05
H055M2, H075M2	Size 4	72	145	140	60±1	5	121.5±1	2 x 5	M4	1.05
HU11M3X, HU15M3X	Size 5	105	143	130	93±1	5	121.5±1	2 x 5	M4	1.25
HU11M2, HU15M2, HU22M3X, H037N4, H055N4, H075N4, HU11N4,HU15N4, H075S6X, HU15S6X	Size 6	105	143	150	93±1	5	121.5±1	2 x 5	M4	1.35

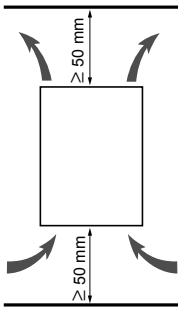


ATV31		a mm	b mm	c (1) mm	G mm	hr mm	H mm	Ø mm	For screw	Weight kg
HU22M2, HU30M3X, HU40M3X, HU22N4, HU30N4, HU40N4, HU22S6X, HU40S6X	Size 7	140	184	150	126±1	6.5	157±1	4 x 5	M4	2.35
HU55M3X, HU75M3X, HU55N4, HU75N4, HU55S6X, HU75S6X	Size 8	180	232	170	160±1	5	210±1	4 x 5	M4	4.70
HD11M3X, HD15M3X, HD11N4, HD15N4, HD11S6X, HD15S6X	Size 9	245	330	190	225±1	7	295±1	4 x 6	M5	9.0

(1) For drives in the A range, add 8 mm for the protruding potentiometer button.

Mounting

Mounting and temperature conditions

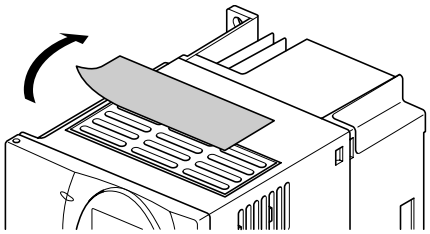


Install the unit vertically, at ± 10°.
Do not place it close to heating elements.
Leave sufficient free space to ensure that the air required for cooling purposes can circulate from the bottom to the top of the unit.

Free space in front of unit: 10 mm minimum.

When IP20 protection is adequate, we recommend that the protective cover on the top of the drive be removed, as shown below.

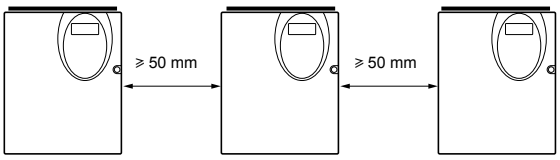
Removing the protective cover



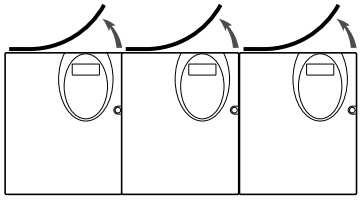
Example ATV31HU11M3X

3 types of mounting are possible:

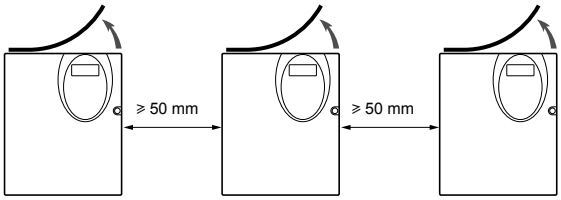
Type A mounting: Free space ⩾ 50 mm on each side, with protective cover fitted



Type B mounting: Drives mounted side-by-side, protective cover removed (the degree of protection becomes IP20)

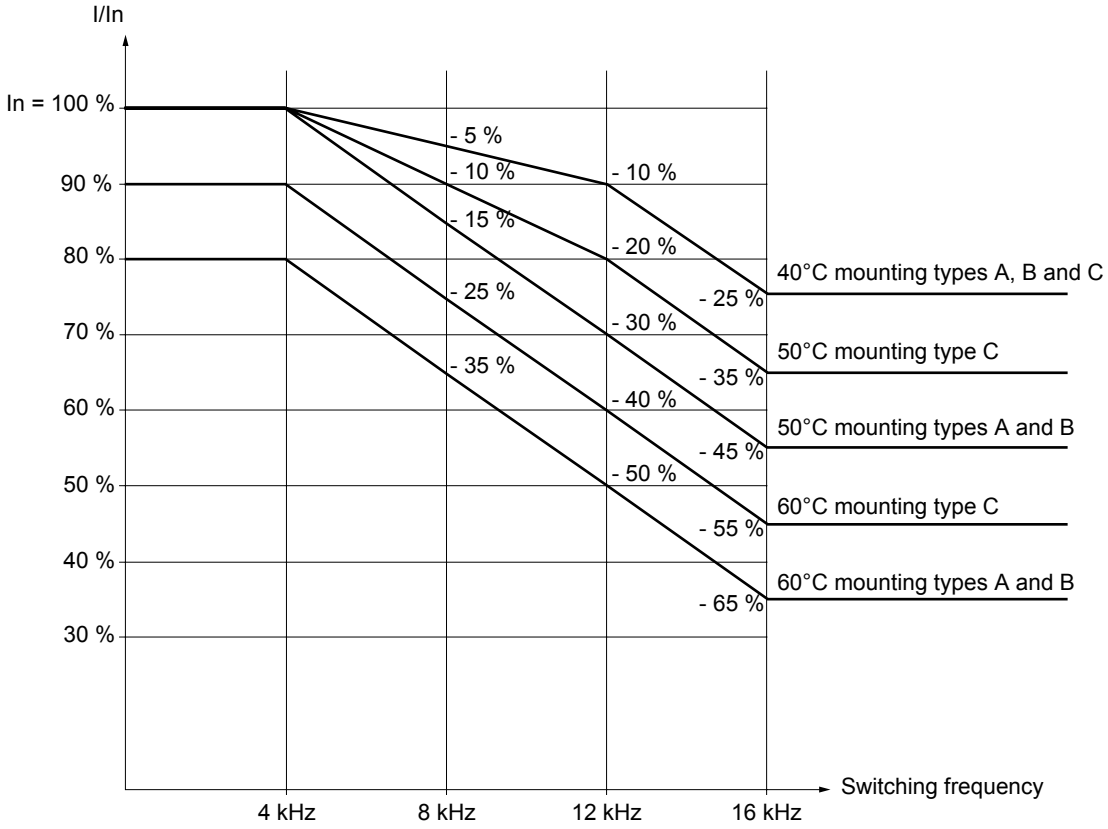


Type C mounting: Free space ⩾ 50 mm on each side, protective cover removed (the degree of protection becomes IP20)



Mounting

Derating curves for the drive current In as a function of the temperature, switching frequency and type of mounting.



For intermediate temperatures (e.g. 55°C), interpolate between 2 curves.

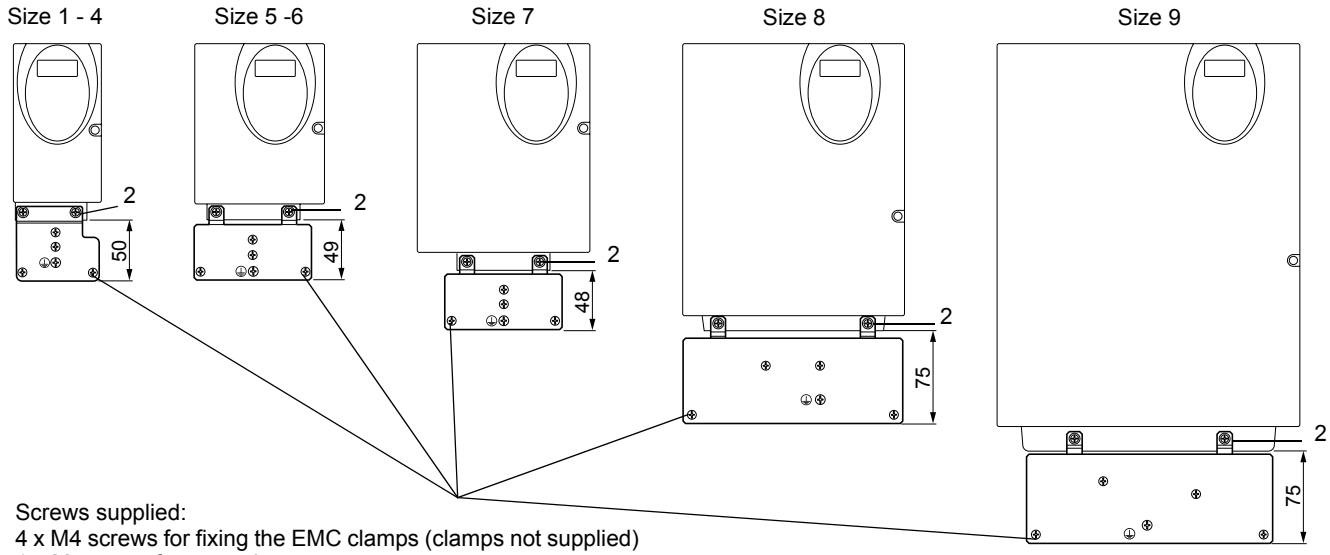
If you are installing the drives in enclosures, make provision for a flow of air at least equal to the value given in the table below for each drive.

ATV31	Flow rate in m^3/hour
H018M2, H037M2, H055M2, H018M3X, H037M3X, H055M3X, H037N4, H055N4, H075N4, HU11N4 H075S6X, HU15S6X	18
H075M2, HU11M2, HU15M2 H075M3X, HU11M3X, HU15M3X HU15N4, HU22N4 HU22S6X, HU40S6X	33
HU22M2, HU22M3X, HU30M3X, HU40M3X HU30N4, HU40N4 HU55S6X, HU75S6X	93
HU55M3X HU55N4, HU75N4 HD11S6X	102
HU75M3X, HD11M3X, HD11N4, HD15N4 HD15S6X	168
HD15M3X	216

Electromagnetic compatibility

EMC mounting plate: Supplied with the drive

Fix the EMC equipotentiality mounting plate to the holes in the ATV 31 heatsink using the 2 screws supplied, as shown in the drawings below.



Screws supplied:
4 x M4 screws for fixing the EMC clamps (clamps not supplied)
1 x M5 screw for ground

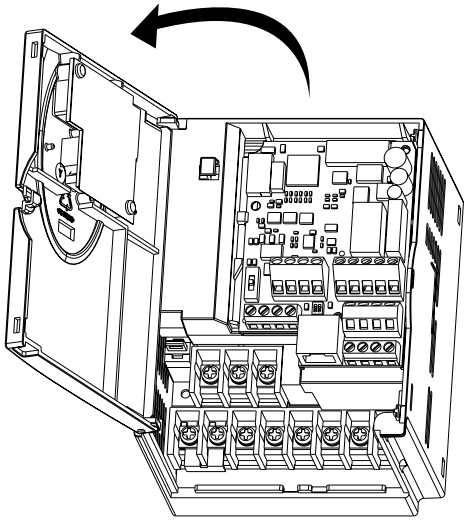
ATV31	
H018M3X, H037M3X	Size 1
H055M3X, H075M3X	Size 2
H018M2, H037M2	Size 3
H055M2, H075M2	Size 4
HU11M3X, HU15M3X	Size 5
HU11M2, HU15M2, HU22M3X, H037N4, H055N4, H075N4, HU11N4, HU15N4, H075S6X, HU15S6X	Size 6

ATV31	
HU22M2, HU30M3X, HU40M3X, HU22N4, HU30N4, HU40N4, HU22S6X, HU40S6X	Size 7
HU55M3X, HU75M3X, HU55N4, HU75N4, HU55S6X, HU75S6X	Size 8
HD11M3X, HD15M3X, HD11N4, HD15N4, HD11S6X, HD15S6X	Size 9

Wiring

Access to terminals

To access the terminals, open the cover as shown in the example below.



Example ATV31HU11M2

Power terminals

Connect the power terminals before connecting the control terminals.

Power terminal characteristics

Altivar ATV 31	Maximum connection capacity		Tightening torque in Nm
	AWG	mm^2	
H018M2, H037M2, H055M2, H075M2, H018M3X, H037M3X, H055M3X, H075M3X, HU11M3X, HU15M3X	AWG 14	2.5	0.8
HU11M2, HU15M2, HU22M2, HU22M3X, HU30M3X, HU40M3X, H037N4, H055N4, H075N4, HU11N4,HU15N4, HU22N4, HU30N4, HU40N4 H075S6X, HU15S6X, HU22S6X, HU40S6X	AWG 10	6	1.2
HU55M3X, HU75M3X, HU55N4, HU75N4, HU55S6X, HU75S6X	AWG 6	16	2.2
HD11M3X, HD15M3X, HD11N4, HD15N4, HD11S6X, HD15S6X	AWG 3	25	4

Power terminal functions

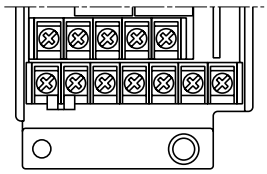
Terminal	Function	For Altivar ATV 31
⏚	Ground terminal	All ratings
R/L1 S/L2	Power supply	ATV31●●●●M2
R/L1 S/L2 T/L3		ATV31●●●●M3X ATV31●●●●N4 ATV31●●●●S6X
PO	DC bus + polarity	All ratings
PA/+	Output to braking resistor (+ polarity)	All ratings
PB	Output to braking resistor	All ratings
PC/-	DC bus - polarity	All ratings
U/T1 V/T2 W/T3	Outputs to the motor	All ratings

Never remove the commoning link between PO and PA/+.

Wiring

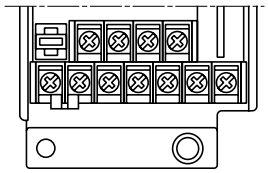
Arrangement of the power terminals

ATV 31H018M3X, H037M3X, H055M3X, H075M3X



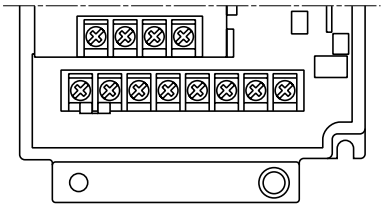
		R/L1	S/L2	T/L3		
P0	PA/+	PB	PC/-	U/T1	V/T2	W/T3

ATV 31H018M2, H037M2, H055M2, H075M2



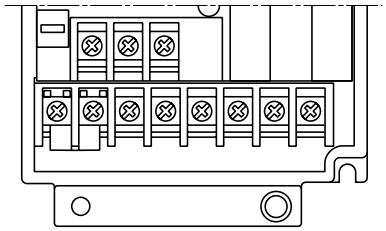
		R/L1	S/L2			
P0	PA/+	PB	PC/-	U/T1	V/T2	W/T3

ATV 31HU11M3X, HU15M3X, HU22M3X, HU30M3X, HU40M3X, H037N4, H055N4, H075N4, HU11N4, HU15N4, HU22N4, HU30N4, HU40N4, H075S6X, HU15S6X, HU22S6X, HU40S6X



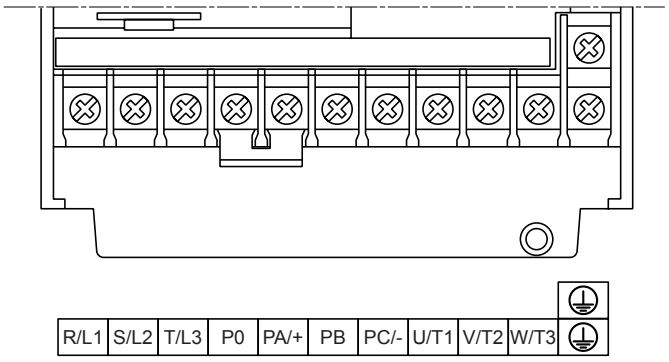
	R/L1	S/L2	T/L3				
P0	PA/+	PB	PC/-	U/T1	V/T2	W/T3	

ATV 31HU11M2, HU15M2, HU22M2



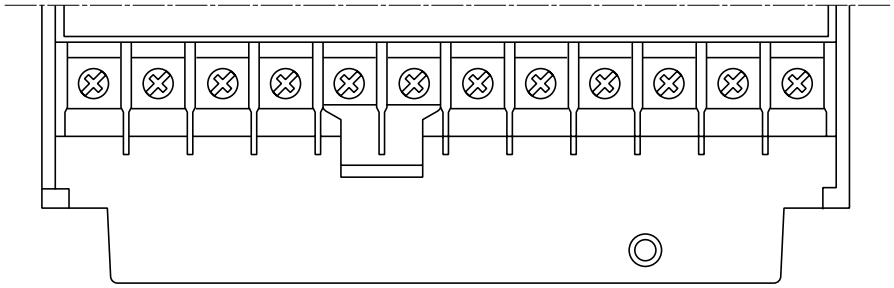
	R/L1	S/L2					
P0	PA/+	PB	PC/-	U/T1	V/T2	W/T3	

ATV 31HU55M3X, HU75M3X, HU55N4, HU75N4, HU55S6X, HU75S6X



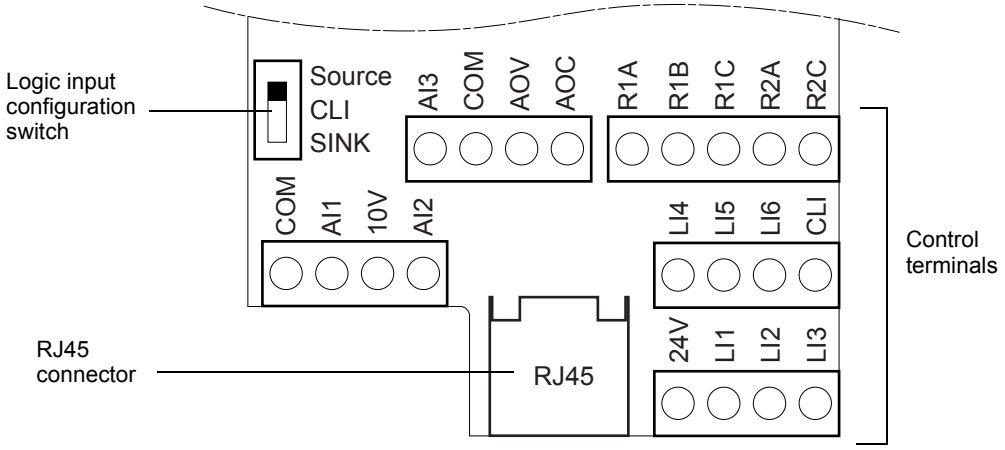
R/L1	S/L2	T/L3	P0	PA/+	PB	PC/-	U/T1	V/T2	W/T3	

ATV 31HD11M3X, HD15M3X, HD11N4, HD15N4, HD11S6X, HD15S6X



	R/L1	S/L2	T/L3	P0	PA/+	PB	PC/-	U/T1	V/T2	W/T3	

Control terminals



- Maximum connection capacity: 2.5 mm^2 - AWG 14
- Max. tightening torque: 0.6 Nm

Control terminals

Arrangement, characteristics and functions of the control terminals

Terminal	Function	Electrical characteristics
R1A R1B R1C	Common point C/O contact (R1C) of programmable relay R1	• Min. switching capacity: 10 mA for 5 V ⎓ • Max. switching capacity on resistive load (cos φ = 1 and L/R = 0 ms): 5 A for 250 V ∿ and 30 V ⎓ • Max. switching capacity on inductive load (cos φ = 0.4 and L/R = 7 ms): 1.5 A for 250 V ∿ and 30 V ⎓ • Sampling time 8 ms • Service life: 100,000 operations at max. switching power 1,000,000 operations at min. switching power
R2A R2C	N/O contact of programmable relay R2	

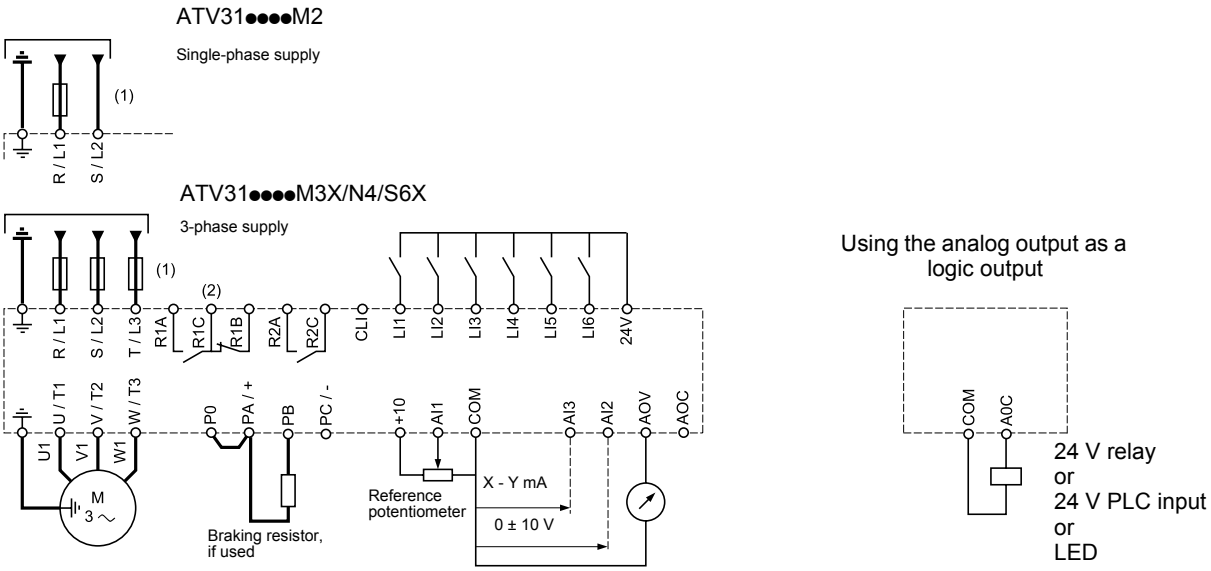
COM	Analog I/O common	0 V
AI1	Analog voltage input	Analog input 0 + 10 V (max. safe voltage 30 V) • Impedance 30 kΩ • Resolution 0.01 V, 10-bit converter • Precision ± 4.3%, linearity ± 0.2%, of max. value • Sampling time 8 ms • Operation with shielded cable 100 m max.
10 V	Power supply for setpoint potentiometer 1 to 10 kΩ	+10 V (+ 8% - 0), 10 mA max, protected against short-circuits and overloads
AI2	Analog voltage input	Bipolar analog input 0 ± 10 V (max. safe voltage ± 30 V) **The + or - polarity of the voltage on AI2 affects the direction of the setpoint and therefore the direction of operation.** • Impedance 30 kΩ • Resolution 0.01 V, 10-bit + sign converter • Precision ± 4.3%, linearity ± 0.2%, of max. value • Sampling time 8 ms • Operation with shielded cable 100 m max.

AI3	Analog current input	Analog input X - Y mA. X and Y can be programmed from 0 to 20 mA • Impedance 250 Ω • Resolution 0.02 mA, 10-bit converter • Precision ± 4.3%, linearity ± 0.2%, of max. value • Sampling time 8 ms
COM	Analog I/O common	0 V
AOV AOC	Analog voltage output AOV or Analog current output AOC or Logic voltage output AOC AOV or AOC can be assigned (either, but not both)	Analog output 0 to 10 V, min. load impedance 470 Ω or Analog output X - Y mA. X and Y can be programmed from 0 to 20 mA, max. load impedance 800 Ω • Resolution 8 bits (1) • Precision ± 1% (1) • Linearity ± 0.2% (1) • Sampling time 8 ms This analog output can be configured as a 24 V logic output on AOC, min. load impedance 1.2 kΩ. (1) Characteristics of digital/analog converter.

24 V	Logic input power supply	+ 24 V protected against short-circuits and overloads, min. 19 V, max. 30 V Max. customer current available 100 mA
LI1 LI2 LI3	Logic inputs	Programmable logic inputs • + 24 V power supply (max. 30 V) • Impedance 3.5 kΩ • State 0 if < 5 V, state 1 if > 11 V (voltage difference between LI- and CLI) • Sampling time 4 ms

LI4 LI5 LI6	Logic inputs	Programmable logic inputs • + 24 V power supply (max. 30 V) • Impedance 3.5 kΩ • State 0 if < 5 V, state 1 if > 11 V (voltage difference between LI- and CLI) • Sampling time 4 ms
CLI	Logic input common	See page 12.

Wiring diagram for factory settings



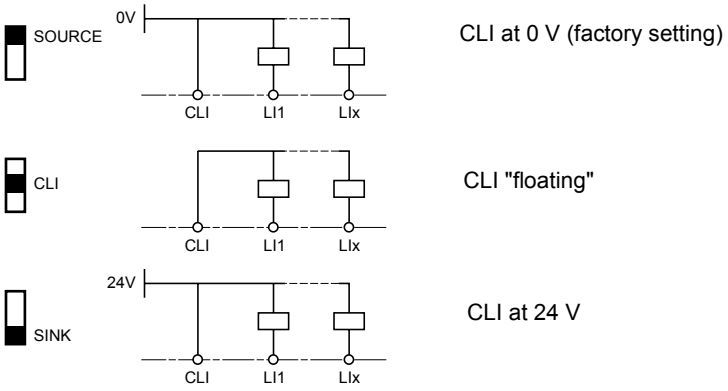
(1) Line choke, if used (single phase or 3-phase)
(2) Fault relay contacts, for remote indication of the drive status.

Note: Fit interference suppressors to all inductive circuits near the drive or coupled to the same circuit (relays, contactors, solenoid valves, etc).

Choice of associated components:
Please refer to the catalogue.

Logic input switch

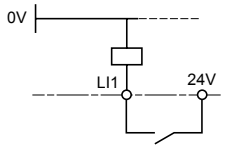
This switch assigns the logic input common link to 0V, 24 V or "floating":



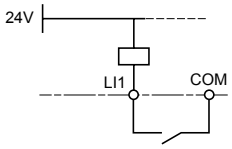
Examples of recommended circuit diagrams

Using volt-free contacts

- Switch in "Source" position
  (ATV31 factory setting for types other than ATV31●●●●A)

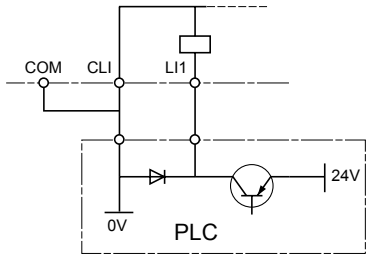


- Switch in "SINK" position
  (factory setting for ATV31●●●●A)

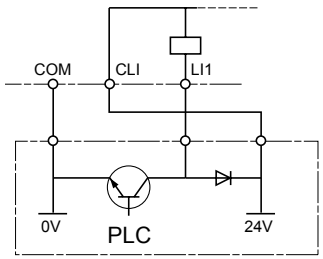


Using PLC transistor outputs

- Switch in CLI position



- Switch in CLI position



Wiring recommendations

Power

The drive must be earthed to conform with the regulations concerning high leakage currents (over 3.5 mA).
When upstream protection by means of a "residual current device" is required by the installation standards, a type A device should be used for single-phase drives and type B for 3-phase drives. Choose a suitable model incorporating:

- HF current filtering
- A time delay which prevents tripping caused by the load from stray capacitance on power-up. The time delay is not possible for 30 mA devices. In this case, choose devices with immunity against accidental tripping, for example RCDs with reinforced immunity from the **s.i** range (Merlin Gerin brand).

If the installation includes several drives, provide one "residual current device" per drive.

Keep the power cables separate from circuits in the installation with low-level signals (detectors, PLCs, measuring apparatus, video, telephone).

If you are using cables > 50 m between the drive and the motor, add output filters (please refer to the catalogue).

Control

Keep the control circuits away from the power cables. For control and speed reference circuits, we recommend using shielded twisted cables with a pitch of between 25 and 50 mm, connecting the shielding to ground at each end.

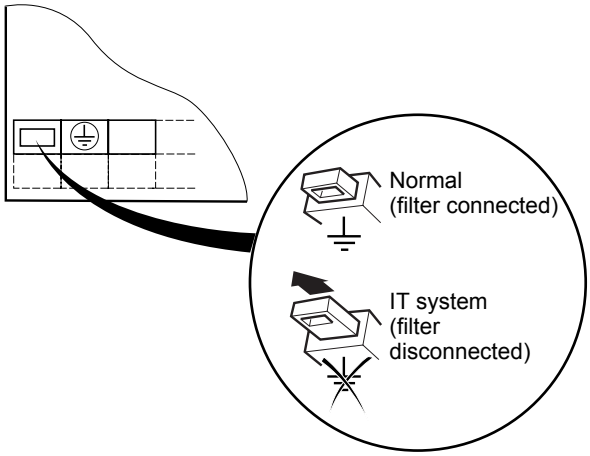
Operation on an IT system

IT system: Isolated or impedance earthed neutral.
Use a permanent insulation monitor compatible with non-linear loads (a Merlin Gerin type XM200, for example).

ATV 31●●●M2 and N4 drives feature built-in RFI filters. These filters can be isolated from ground for operation on an IT system as follows:

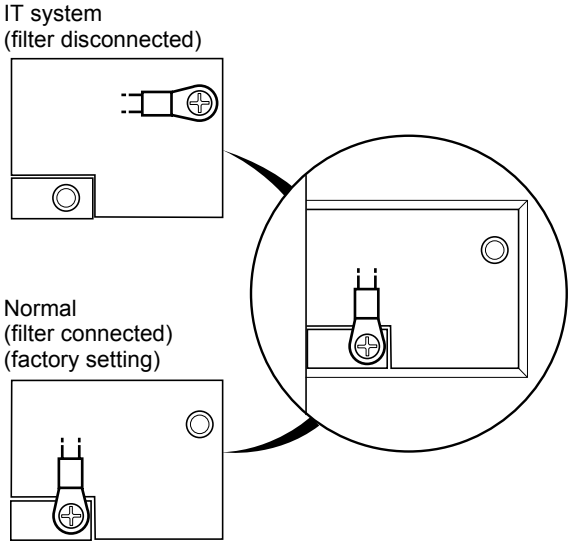
ATV31H018M2 to U22M2 and ATV31H037N4 to U40N4:

Pull out the jumper on the left of the ground terminal as illustrated below.



ATV31HU55N4 to D15N4:

Move the cable tag on the top left of the power terminals as illustrated below (example ATV31HU55N4):



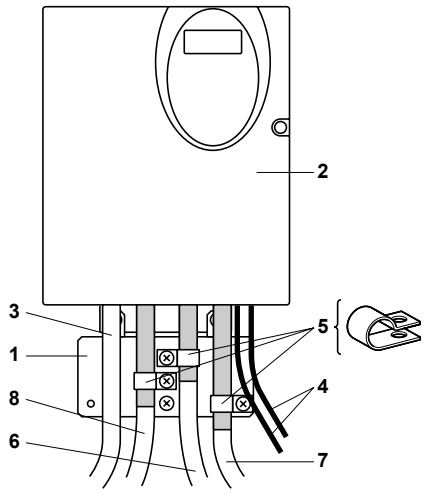
Electromagnetic compatibility

Principle

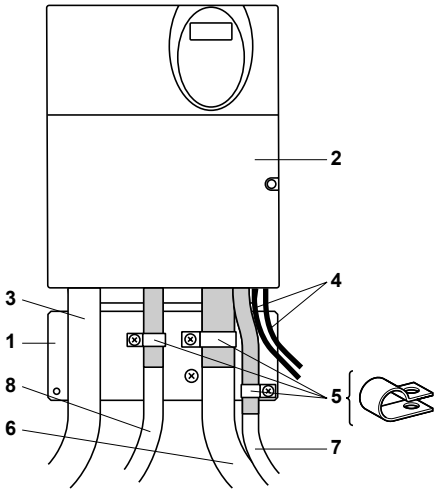
- Grounds between the drive, motor and cable shielding must have "high frequency" equipotentiality.
- Use shielded cables with shielding connected to ground throughout 360° at both ends for the motor cable **6**, braking resistor (if used) **8**, and control-signalling cables **7**. Metal ducting or conduit can be used for part of the shielding length provided that there is no break in continuity.
- Ensure maximum separation between the power supply cable (line supply) and the motor cable.

Installation diagram (examples)

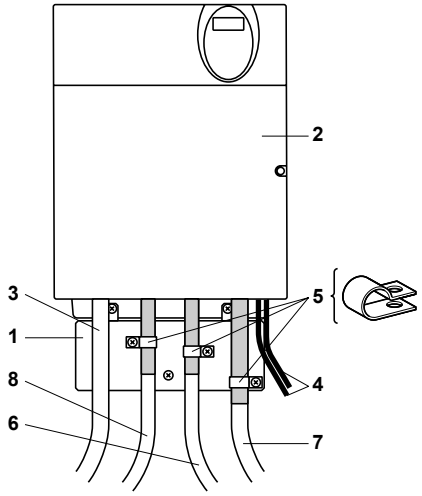
Sizes 1 to 7



Size 8



Size 9



	Size 1	Size 2	Size 3	Size 4	Size 5	Size 6	Size 7	Size 8	Size 9
ATV31	H018M3X, H037M3X	H055M3X, H075M3X	H018M2, H037M2	H055M2, H075M2	HU11M3X, HU15M3X	HU11M2, HU15M2 HU22M3X H037N4, H055N4, H075N4, HU11N4, HU15N4 H075S6X, HU15S6X	HU22M2 HU30M3X, HU40M3X HU22N4, HU30N4, HU40N4 HU22S6X, HU40S6X	HU55M3X, HU75M3X HU55N4, HU75N4 HU55S6X, HU75S6X	HD11M3X, HD15M3X HD11N4, HD15N4 HD11S6X, HD15S6X

1 Sheet steel grounded plate supplied with the drive, to be fitted as indicated on the diagram.

2 Altivar 31

3 Non-shielded power supply wires or cable

4 Non-shielded wires for relay contacts

5 Fix and ground the shielding of cables **6**, **7** and **8** as close as possible to the drive:
- Strip the shielding.
- Use stainless steel cable clamps of an appropriate size on the parts from which the shielding has been stripped, to attach them to the plate **1**.
The shielding must be clamped tightly enough to the metal plate to ensure correct contact.

6 Shielded cable for motor connection with shielding connected to ground at both ends.
The shielding must be continuous and intermediate terminals must be in EMC shielded metal boxes.
For 0.18 to 1.5 kW drives, if the switching frequency is higher than 12 kHz, use cables with low linear capacitance: max. 130 pF (picoFarads) per metre.

7 Shielded cable for connecting the control/signalling wiring.
For applications requiring several conductors, use cables with a small cross-section (0.5 mm^2).
The shielding must be connected to ground at both ends. The shielding must be continuous and intermediate terminals must be in EMC shielded metal boxes.

8 Shielded cable for connecting braking resistor (if fitted).
The shielding must be continuous and intermediate terminals must be in EMC shielded metal boxes.

Note:
- If using an additional input filter, it should be mounted under the drive and connected directly to the line supply via an unshielded cable. Link 3 on the drive is then via the filter output cable.
- The HF equipotential ground connection between the drive, motor and cable shielding does not remove the need to connect the PE protective conductors (green-yellow) to the appropriate terminals on each unit.